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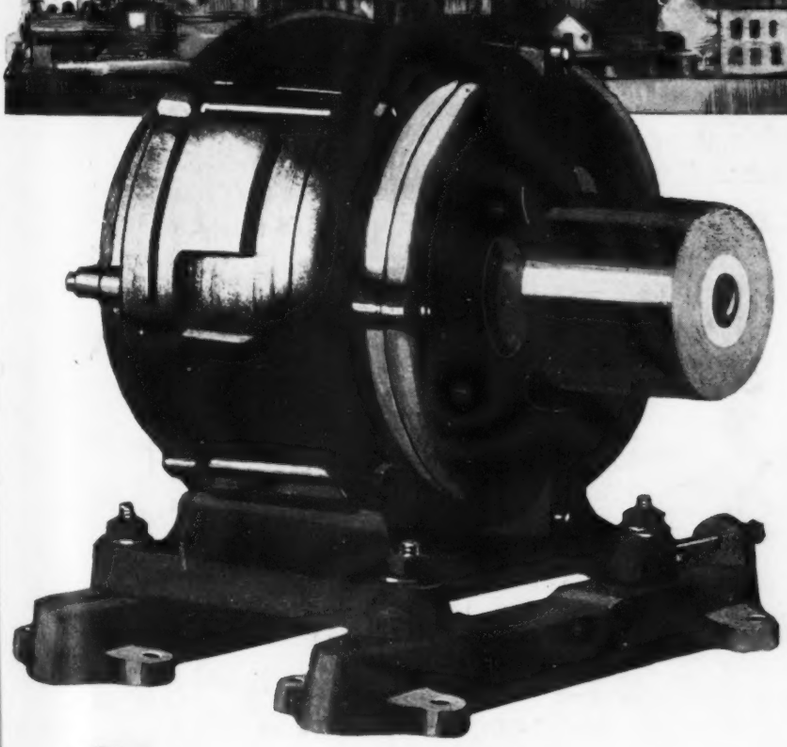

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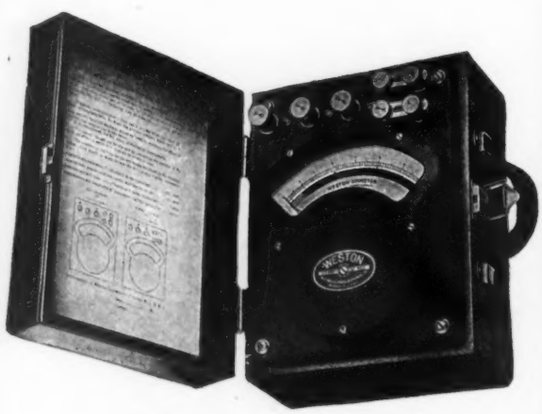

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Volume 77 New York, Saturday, March 19, 1921 *Number* 12

Taxes on a War Basis in Peace Times

WITH the paying of the first installment of income and excess-profits taxes on Tuesday of this week attention was again vividly directed to the cost of wars and preparations for wars. At the same time, the official estimates of revenue this year from income taxes—two and a half billions of dollars—when compared with nearly four billions (70 per cent of all taxes) collected in 1920, furnish an index to the extent of deflation in industries and the vanishing of profits created by military needs, thus making the taxing of incomes on a war basis obsolete and ineffective. Every breadwinner, together with those who are responsible for the management of the industries and business of this country, is confidently looking to Congress for a new program of reductions in the costs of government and revised methods for raising revenue that will make it possible to amend the income-tax laws so as to eliminate excess-profits taxes and the higher surtaxes. Such a revision would have a prompt and stimulating effect on all lines of business, acting like a tonic on an emaciated convalescent.

Nothing to Fear in a Falling Market

MANUFACTURERS must be prepared to meet the cry for lower prices, not necessarily because their prices are unduly high, but because other commodities, which have hitherto been almost out of reach, are beginning to approach normal. The public is inclined to believe that all manufacturers have profiteered, and the burden of proof therefore will be thrust on the producer. Moreover, in a buyers' market every intelligent manufacturer and jobber will want to be on the right basis with his customers. Now, while prices in many industries have soared skyward and production likewise, those in the electrical industry have as a rule been conservative, and very markedly so. We must not, however, assume a "holier than thou" attitude on that account, but must scrutinize our business and methods to make sure that we are ready to serve our customers as they want to be served and not just as we want to serve them. Very surely, unreasonable demands will be made on the industry, and these will have to be dealt with sympathetically but firmly. If it is possible to grant reductions or better terms, these should be given, and if business can be restarted by taking some losses, it may be the part of wisdom to bear them. But it is short-sighted to put artificial props under trade and industry in an attempt to prevent readjustment. It will also avail nothing to offer goods at cost or less if there are no takers. First determine if there is a market and then ascertain what must be done to satisfy the demand. The electrical industry has been too sane during the flurry and bluster of the war to be stampeded now into instability and error because of temporary depression. Having acquitted ourselves nobly and honorably, there is nothing to fear.

Carrying the Utility Message to the People

A GENERATION ago every one became familiar with the exhortation to "carry the message to Garcia." Today, within the perspective of the public utilities there is a multitudinous Garcia, physically tangible though mentally remote, known as the people, and to carry their message to the people is an object deserving and requiring all the tact, ardor and perseverance that utility men can bring to the task. In its own way it is as difficult an undertaking as pursuing an elusive general through the unmapped regions of his native Cuba. The technical and industrial journals, with their specialized circulation, cannot reach the people directly. The daily press, from the utility point of view, may be roughly divided into two classes—the conservative newspapers, which the public is prone to class as organs of the "interests," and the radical sheets, which carry chiefly the counterfeit and truculent messages of the demagogue. It is refreshing therefore to find a popular national weekly acting as a volunteer messenger from the electric light and power industry to its millions of readers, and the editorial printed in *Collier's* for March 12, to which we make more extended reference on another page, will be hailed as a promising sign of the times by all branches of the great electrical industry.

Public Ownership of Securities Will Offset Agitation

IN THOSE communities where there prevails agitation for home rule or municipal ownership public utilities are benefiting by encouraging the purchase of their securities by the local public. It is not sufficient merely to offer the securities for sale. They must be offered in small enough denominations or on the easy-payment plan so that all can buy. They must be made readily available across a counter, like bread in a grocery store. They must be advertised and the easy-payment plan featured. Above all, the public's whim should be met by pointing out that here is an opportunity for the citizens to own the local lighting company. Perhaps the proportion of the total securities taken by customers will be small, but that is not important if the portion which is taken is well distributed. Every holder of securities will take a new interest in the company. Because he has money invested in it he will be anxious for its prosperity, and the desires of many citizens, even if their holdings are small, will naturally

lead public utility commissions to consider an increased rate of return on public utility investments more impartially.

Aside from the fact that distribution of securities among the townspeople will make them more sympathetic, it will make the securities more attractive to outside investors. These will have more confidence in an investment that is attractive to the local public; they will have less fear of municipal-ownership agitation; they will feel that they have a better opportunity to get a reasonable return on their investment. Ownership of utility securities by company employees should also be fostered as the surest method of increasing their loyalty and aiding economical operation. Old as these ideas are, they are not everywhere appreciated, and hence their constant reiteration needs no apology.

Load Factor and Fuel Cost Determine Importance of Economy

EXPERIENCE has shown that few hydraulic privileges can be developed to anything like their proper value without occasional aid from steam auxiliaries. In rare instances storage sufficient fully to equalize the flow of a stream is available, and then aid from steam is necessary only for the purpose of emergency protection against breakdown. Very frequently this reserve is obtained by leaving intact some displaced steam plant with electrical equipment enough to aid in emergencies. Aside from this unusual condition steam may be needed for brief periods to carry a system peak over a considerable portion of the year, as in the development of streams for something over the minimum flow, for a considerable part of the operating hours and at variable load when a larger amount of secondary power from the hydraulic standpoint is developed, and finally for a large service all the time. In the latter case the tail is apt to wag the dog, and the real auxiliary is hydraulic instead of steam.

The design of plants to meet these varying requirements is perhaps a task for the prophet rather than the engineer, but the paper by E. B. Powell in this issue gives a very clear notion of the way in which these various types of auxiliary have to be worked out to give the best economic result. The broad general principle underlying it all is, of course, that the less an auxiliary plant is used the heavier relatively become its fixed charges per kilowatt-hour furnished and the less important relatively the running or fuel charges. This indicates a cheap and relatively inefficient plant, or at least a plant in which operating efficiency is sacrificed to insure low fixed charges. As the probable use of the plant increases the operating and fixed charges change in relative value until finally a point is reached where it is necessary to build for relatively heavy steam service obtained on the most economical basis possible.

With rising costs of fuel and rising costs of labor the importance of a plant which can be run economically becomes relatively much greater than it was fifteen or twenty years ago or even prior to the war. In earlier days it was easy to make the mistake of overestimating the probable use of an auxiliary plant and providing a very beautifully worked out steam station which proved from lack of use a liability rather than an asset. Such mistakes can be made today, but much less frequently, and we are disposed to think that the emergency plant will gradually become more elaborate and refined as fuel costs increase until in the majority of instances a very small part of its pristine simplicity will be left. However, as we have previously remarked, the real solution of the problem primarily requires the vision of a prophet.

Recent Attainments in Wired Radio

A NUMBER of interesting results based on studies and practical tests made by Signal Corps officers during recent months, such as telephonic communication between a fixed terminal station and a railroad train moving parallel to the line wire employed, were described in the *Journal of the Franklin Institute* for January last, by R. D. Duncan, Jr. The frequencies used in the test alluded to were relatively high (300,000 to 600,000 cycles per second), or such as ordinarily are used in radio telegraphy. The amount of power developed at the generating end was surprisingly small considering the distance to which communication could be carried.

An important question which presents itself at such frequencies is the value of the hyperbolic angle subtended by a line of given length and size of wire. The electrical constants of the line, such as the linear resistance, inductance, capacitance and leakance, are not necessarily the same as at ordinary low frequencies. It is pointed out that, according to existing theory, the linear resistance rises considerably toward high frequencies, partly owing to skin effect and partly owing to radiation. The linear leakance also increases considerably, partly owing to radiation; but the linear inductance and capacitance remain fairly constant. The vector sending-end impedance of a line is thus compelled to execute a series of spirals as the frequency is changed.

Misuse of Engineering Data for Legal Purposes

THE misuse of engineering data in either court or commission proceedings is a rather common occurrence. From the standpoint of professional ethics, if for no other reason, such practices should be severely condemned. It is to be regretted that there is not some method of calling to account individuals who will indulge in them. A recent conspicuous instance is the testimony of witnesses before a state commission regarding the telephone interference factor, on which the American Institute of Electrical Engineers has presented reports of studies. One witness under examination said:

"The interference factor is something that is the meter or the means for measuring the interference between a power line and a telephone line, something that is not at all private property as far as the telephone company is concerned, but came out in the last two years by the American Institute of Electrical Engineers, who have spent a lot of time in these kinds of investigations, and it is a means agreed upon by them as satisfactory of measuring the effect that certain power lines have in certain voltages, current and machinery on telephone lines."

Another witness said: "I would also like to point out that the American Institute of Electrical Engineers has investigated this question of telephone interference factor, not as a telephone company but as an institution of unbiased engineers, and that means that the representatives of the power companies were interested in this

investigation and took part in it just as much as the telephone engineers did, and these tests show, as I have studied them in the *Transactions* of the American Institute of Electrical Engineers, that any such telephone interference factor as we have here, of 173, is considered—must be considered—very high in comparison to other known measurements of telephone interference factors."

These are verbatim quotations from a transcript of the evidence, and the impression throughout the testimony is that the telephone interference factor is an established standard providing a definite and complete means for evaluating inductive interference. Reference to a review of the committee's work as presented to the Institute in February, 1919, shows that the factor is far from a definite one in the sense that such units as "horsepower," "kilowatt" and other like terms are definite. The report was presented to "encourage the trial use of telephone interference factor and the collection of information by any who are interested," and the determination of limiting values was deferred because of the lack of definite information on which to base a conclusion.

At the present moment the inductive interference committee of the National Electric Light Association and the wave-shape sub-committee of the Institute are carrying on studies designed to provide definite information from which further conclusions can be drawn. The factor as so far defined does not furnish a quantitative measure of the interference of a power line with the telephone service, but is more correctly a measure of the sensitivity of the present standard telephone receiver to the wave shape of periodic induction currents flowing through it, regardless of their source. An analysis of the committee reports does not furnish any reason for assuming that the data on which the rule is based justify the application of the factor in such a case as the one in question with any hope of obtaining a correct basis for important decisions. The rule does not consider the effect of balance of the power and telephone circuits, the degree of co-ordination of the transposition systems, the dimensions of the parallel or a number of other factors that are equally important. In short, as defined, it is not in any sense a standard for the complete measurement of inductive interference.

It is regrettable that such testimony should be injected into a national question which has already been the subject of a great deal of controversy. Whether justified or not, the conclusion is bound to be drawn in some quarters that improper use is being made of actions of the American Institute of Electrical Engineers clearly intended to help in the working out of an admittedly difficult situation. In the particular case involved the result has been to drag into a commission hearing not only the incomplete work of the Institute committee but also the investigations that are being carried on by the National Electric Light Association inductive interference committee in the endeavor to advance the study. None of these investigations is in any way complete enough to admit of conclusions. For that reason the information is practically valueless in arriving at decisions.

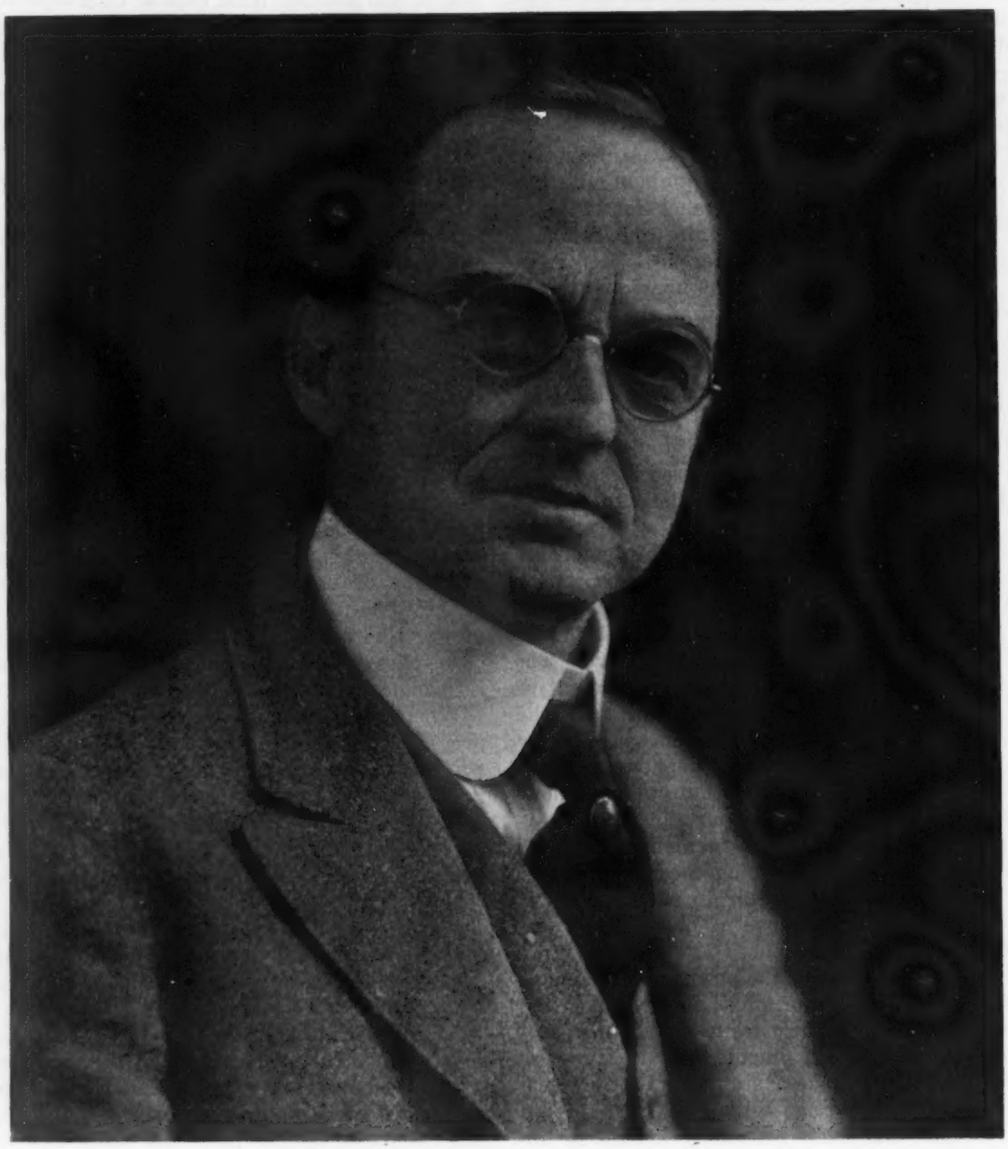
The men controlling the destinies of both the power and telephone industries can well pause and consider the end to which this sort of thing leads. The public is just as vitally interested, and if such incidents are allowed to occur a conflict will develop in which the public will ultimately take a part that will not be welcome to either of the two industries. There was never a better time to about face than right now. The solution of the problem must depend on co-operation between the power and telephone industries exercised in such a way as to solve the problem with the least total interference to the service of either utility.

House-Wiring Contracts Obtained at $6.57 Each

"SERMONETTES" have appeared in the ELECTRICAL WORLD at frequent intervals during the last forty years with house wiring as the text. The conviction consistently maintained can still be emphasized, namely, that central-station companies can increase their gross revenue in no more permanent way than through an aggressive policy aimed at increasing both the percentage of residence service connections in the territory served by the distribution network and the degree of use of electric service from each connection. Not long ago a comprehensive report was published in the ELECTRICAL WORLD (May 15, 1920) showing the number and distribution of houses that are now wired—a report that indicated commendable activity in some sections and sins of omission in many others. In this issue L. J. Wilhoite gives an instructive account of the work of the Chattanooga (Tenn.) company during the past two years that furnishes inspiration and much useful information on this familiar subject.

When the campaign was started early in 1919 the program was laid out for an indefinite period, with a grim determination to get all the business in sight irrespective of previous theoretical data. The customary difficulties were promptly found—conservatism on the part of the customer, sluggishness on the part of the contractor and little precedent in determining the most desirable lines of attack. In picking out the needed salesmen a somewhat unusual, if not unprecedented, course was followed in which "push and snap" in ringing doorbells was given preference over a knowledge of the central-station business or technical experience, such fundamental instruction as the salesmen might need being furnished through an impromptu night school. The results obtained, however, amply justify the departure from former practice since by means of this campaign the company has taken on something like three thousand residence customers with more in sight. Moreover, the tentative allowance of about $10 per customer which had been figured out as the probable cost was reduced a little more than one-third.

To pessimistic central-station men who still have lurking doubts about the cost and value of house-wiring campaigns the Chattanooga results are a practical object lesson. As to the possibilities of residence connections as revenue producers, we may also casually mention that a good many gas companies live, move and have their being and pay dividends on residence business; while from the electrical service standpoint Mr. Wilhoite pungently remarks, "We know of a man who owns a central-station system with less than half this number of customers on its lines and is making a very good living out of it." Good effects from a really energetic house-wiring campaign in face of all the difficulties that go with the wiring of old houses are not peculiar to Southern cities—the idea can be applied with profit almost anywhere in times like these, when buying needs stimulation of a healthy sort and business is not dead but just hard to get.



Willis Rodney Whitney

A profound scientist whose practical conception of research work and the results of whose labors have furnished inspiration to investigators of all nations

THE opportunity and the resources to create a great research laboratory dedicated to investigations in pure science on a large scale have come to few scientists. Such an opportunity was offered Dr. W. R. Whitney more than twenty years ago when he was asked to become director of industrial research for the General Electric Company. Endowed with marked ability as an investigator and with a vision of the practical needs of industry in the unsurveyed fields of pure science, Dr. Whitney has applied organized research with results that have been of great benefit to civilization in all lands.

To the electrical industry Dr. Whitney is well known for his work in perfecting electric lamps. The first radical improvement in the carbon incandescent filament since Edison was due to his personal work. He devised a filament which had a new form of carbon that gave 25 per cent more light for the same wattage than the standard carbon-filament lamp. Dr. Whitney also did valuable work in the development of the use of wrought tungsten for electric light filaments and in perfecting the gas-filled electric bulbs. Among other investigations made by him have been the study of the laws of heat conduction and radiation, the dissociation of gases at high temperatures and the transformation of other forms of carbon into graphite. From the general public Dr. Whitney's work has received wide recognition because of his having perfected a detector for giving warning of the approach of submarines which was put into practical application during the European war at the Nahant station of the United States Navy. As a member of the Naval Consulting Board he did much for the war development of radio telephony and radio telegraphy.

Dr. Whitney was born in Jamestown, N. Y., Aug. 27, 1868. He was graduated from the Massachusetts Institute of Technology in 1890 with the degree of bachelor of science and in 1896 received the degree of Ph.D. from the University of Leipzig. Since 1900 Dr. Whitney has been director of the research laboratory at Schenectady. Part of his early work, which was done in conjunction with Prof. A. A. Noyes, was the invention of a process through which alcohol and ether can be recovered from collodion. This invention insured the commercial success of the present photographic film. In 1909 Dr. Whitney served as president of the American Chemical Society and in 1912 as president of the American Electrochemical Society. Results of his investigations have been officially recognized by many learned societies through the award of medals and other honors. Among these are the award of the Perkin medal last month by the American Section of the Society of Chemical Industry, the Chandler medal by Columbia University and the Willard Gibbs medal by the Chicago Section of the American Chemical Society.

Design of Relay Power Stations*

Low Construction Cost, Adequate Dependability and Low Attendance Requirements Are Important Factors—Skilled and Well-Trained Operators Are Equally Essential

By E. B. POWELL
Consulting Engineer Stone & Webster, Inc., Boston

SUPPLEMENTAL power in some form is essential to the commercial development of virtually all of the unused water powers in the eastern part of the United States and, with the possible exception of the Niagara and St. Lawrence systems, is essential to the further development of water powers that are now utilized in part. The nature and extent of this supplemental or relay power will be governed in a large measure by the character of the stream, the amount, character and location of the load and the importance of continuity in power supply.

In many instances the required relay may be provided by adding reservoirs, or merely pondage, to give some artificial control of the flow. In other instances the electrical interconnection of water-power systems may afford sufficient relay power. In general, however, the fullest commercial utilization of water power can only be had by the aid of an independent relay, which in the greater part of the country today is most satisfactorily and economically provided by the steam power station.

The capacity and design of such a relay station should be determined by the particular functions it is intended to perform. Although they may vary widely, the functions are of two general types—flow or head-deficiency make-up and emergency reserve. For either type of service the capacity required will depend upon the amount and characteristics, initial and prospective, both of hydraulic development and of load. The design of relay stations, though broadly determined by the usual factors, such as location, power market, water and fuel supplies and fuel costs, is less dependent upon considerations of operating economy than base-load plants on account of the low load factor usually involved in the former.

Character of load and dependability of delivered hydraulic power are factors of prime importance. The design should also be governed in many important features by the characteristics of the hydraulic development and the relation of that development to the load.

FLOW OR HEAD-DEFICIENCY TYPE OF RELAY

Considering first the station intended solely to compensate for power deficiencies of the hydraulic development, its functions may include any one or more of the following: Seasonal operation to make up deficiencies in hydraulic power from low water or flood, absorption of load growth between stages of hydraulic development, and operation as the main source of power. As reflected in the functions of the relay station and as affecting its design, hydraulic developments may be grouped as under four general classifications:

I. *Minimum-Flow Development.* — Developed hydraulic capacity is equal to or exceeds maximum system load. Resultant minimum available flow occurs for brief period in the year and is only slightly below corresponding load requirements. Reserve is provided in hydraulic station.

II. *Medium-Flow Development.*—Developed hydraulic capacity is equal to or exceeds maximum system load. Resultant minimum available flow is below load requirements for considerable period (40 per cent or more) of the year. Reserve is provided in hydraulic station.

III. *Continual-Relay Development.* — Available hydraulic capacity is slightly below system load requirement throughout greater part of the year.

IV. *Supplemental Development.*—Hydraulic development is merely an adjunct to the steam-power station, which carries the bulk of the load.

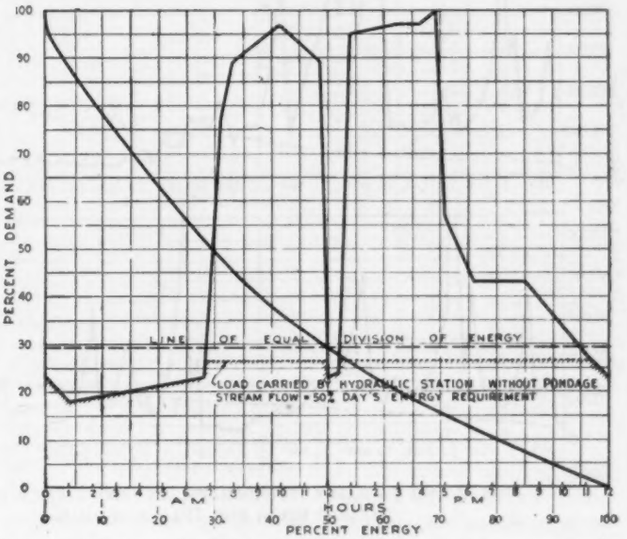


FIG. 1—TYPICAL DAILY LOAD OF MANUFACTURING TOWN WITH 53 PER CENT LOAD FACTOR

The type of reserve referred to in classes I and II is for relay against failure of equipment within the hydraulic station itself. Under the conditions outlined this reserve may often advantageously be installed as part of the hydraulic station rather than in the steam station. As is well known, from 50 to 75 per cent of the cost of the average hydraulic development is fixed and independent of the capacity installed, so that sufficient capacity for this type of reserve may frequently be included at comparatively low unit cost.

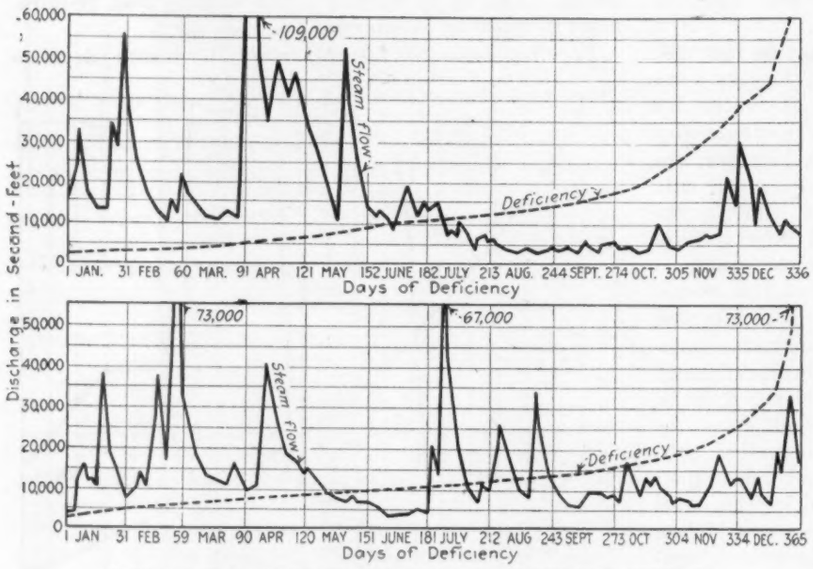
EFFECT OF GROWTH OF LOAD

It will usually be found that the conditions represented by classes I, II and III are merely stages in approach to those of class IV, where the hydraulic development is merely an adjunct to the steam power. Therefore the entire project should be studied broadly in the beginning, both as to the ultimate physical possibilities and limitations of the hydraulic development and

*Discussed at joint meeting of the Boston Sections of the American Society of Mechanical Engineers, American Institute of Electrical Engineers and Boston Society of Civil Engineers.

as to the character and probable growth of the market for power.

The seasonal flow of the Hudson River in New York is so variable that the hydrographs of two successive years, 1915 and 1916, with their corresponding deficiency curves, may be used in illustrating developments of all four of the classes just referred to. In Fig. 2 it will be seen that if this hydrograph is assumed to represent the year of minimum flow and if a flow of about 3,000 sec.-ft. (85 cu.m. per second) would supply the maximum power requirement, a development providing proper equipment reserve at this flow would approximate the conditions of class I. If growth of load raises the daily power demand above the capacity of the available minimum stream flow and this growth of load is accompanied by a corresponding increase of generating capacity of the hydraulic station to utilize say 8,000 sec.-ft. to 10,000 sec.-ft. (226 cu.m. to 284 cu.m. per second), with proper reserve, the conditions become those of class II. Turning to Fig. 3, development of the hydraulic plant to



FIGS. 2 AND 3—DAILY HYDROGRAPH AND DEFICIENCY CURVE OF HUDSON RIVER FOR 1915 AND 1916

utilize a flow of say 10,000 sec.-ft. to 12,000 sec.-ft. (284 cu.m. to 340 cu.m. per second) with daily load demands somewhat in excess of the mean available flow would give the conditions of relay service under class III. Continued growth of load with a single hydraulic development as applied to either type of stream flow will ultimately bring about the conditions represented by class IV.

In the case of many streams it would be feasible to provide sufficient reservoir storage to smooth out the stream flow to a considerable extent, thus raising the minimum or primary capacity of the potential development beyond the maximum load demands considered under classes I and II at least, and possibly beyond that considered under class III. For purposes of the present discussion, however, reservoir storage, as distinct from pondage in the usual sense, will not be further considered, since the effect of adding reservoir capacity in the development will introduce no new conditions of relay service distinct from those applying under the four groups discussed, but may merely shift the development on the scale of the present classification, or possibly remove the occasion for independent relay, from a capacity standpoint. Pondage, on the other hand, does not affect the seasonal variation of the stream; it provides regulation of the daily flow.

EFFECT OF PONDAGE

The effect of pondage upon the relay station requirements may be judged from reference to Fig. 1, which shows a typical manufacturing town load with the "per cent load" curve superimposed for convenience of interpretation. If the minimum flow is assumed equivalent to 50 per cent of the day's energy requirement, with full twenty-four-hour pondage provided, the hydraulic station could take off the upper 70 per cent of the demand, permitting the relay station to carry the base load at a daily load factor approximating 90 per cent with a demand only 30 per cent of the total. On the other hand, in the absence of pondage, the relay station must be designed to carry about 75 per cent of the total demand, and on this basis its daily load factor would be reduced to about 40 per cent. It is apparent that, in the absence of pondage, higher capacity will in general be required in the relay station and the relay station load factors, both daily and annual, will tend to lower values than where full pondage is provided.

RELAY STATION FOR MINIMUM-FLOW DEVELOPMENT

Referring again to Fig. 2 it will be seen from the deficiency curve that if the maximum load demand is within the capacity of the 3,000 sec.-ft. flow which is the developed capacity considered for class I the relay station, except for conditions of equipment failure, should not be called upon for operation in excess of 5 per cent of the year. It is not uncommon for relay stations under such conditions to stand idle an entire year. Obviously, for service of this character the actual operating economy of the relay station is of small moment. Important considerations are low fixed costs and dependability. As the load demands increase and the operating conditions for the relay station approach those of class II steam power production costs are of slightly greater moment, but in general are still tremendously outweighed by fixed charges and other costs independent of production. Usually it is only when the conditions of class III are reached that the annual load factor of the relay station rises to a value sufficient to make fuel economy an important factor in design.

For the extremely low load-factor conditions of class I type of equipment, dimensions and arrangement must all be studied with a view to attaining the desired output with the minimum investment compatible with simplicity of station and low cost of attendance. Type of combustion equipment and the arrangement of furnace must be governed by the character of fuel available. Oil is the ideal fuel for any type of steam relay station, but is not widely available commercially in sufficiently dependable supply. At the present stage of development pulverized fuel involves a greater degree of complication than is usually warranted in the station designed for the extremely low load-factor conditions of this case. Coal in its more ordinary form will in general be the

most satisfactory fuel. The stoking equipment should be of the forced-draft type for high capacity, either underfeed or chain grate, depending upon the class of coal.

Draft facilities should be designed to take care of the maximum rate of combustion that can safely be maintained by furnace and grate over the period of peak load on the station. Economizers cannot be justified for the conditions of class I, but it may be advisable to make provisions for their later installation to meet higher load-factor conditions in the future.

The selection of type and size of boiler, decision as to total rated boiler capacity to be installed and the proportioning of combustion equipment to boiler heating surface must take into account not merely the cost of that equipment but also the costs of building and all related equipment, such as facilities for handling fuel and ashes and mechanical draft. The cost curve of Fig. 4 shows that for the particular case considered, when all related factors are taken into account, boiler heating surface may be installed to the comparatively high ratio to grate area of fifty to one without appreciable increase of total boiler-plant cost. Higher ratios are accompanied by some increases of cost. The use of a lower ratio will result in needless waste of fuel.

Equally broad considerations should be applied to the design and proportioning of the condensing equipment. Considering the net increment cost of the boiler plant per unit of effective steam capacity and the increment cost of condensing plant for unit change of vacuum at the turbine exhaust, the condensing equipment should be designed to give the degree of vacuum under conditions of the required maximum load which will result in the lowest construction cost for the plant as a whole. In Fig. 5 the curves show, also for a particular set of conditions, at *A*, the relative construction costs for condensing equipment to attain different degrees of vacuum, the cost of the 29-in. (737-mm.) design being taken as 100 per cent; at *B*, drawn to the same scale, the increase in boiler-plant cost resulting from the increased total steam demand which is had from different degrees of vacuum less than 29 in., and at *C*, which is a summation of *A* and *B*, still expressed in terms of 29-in. condensing-plant cost, the resultant effect upon total station cost of designing the plant for different degrees of vacuum.

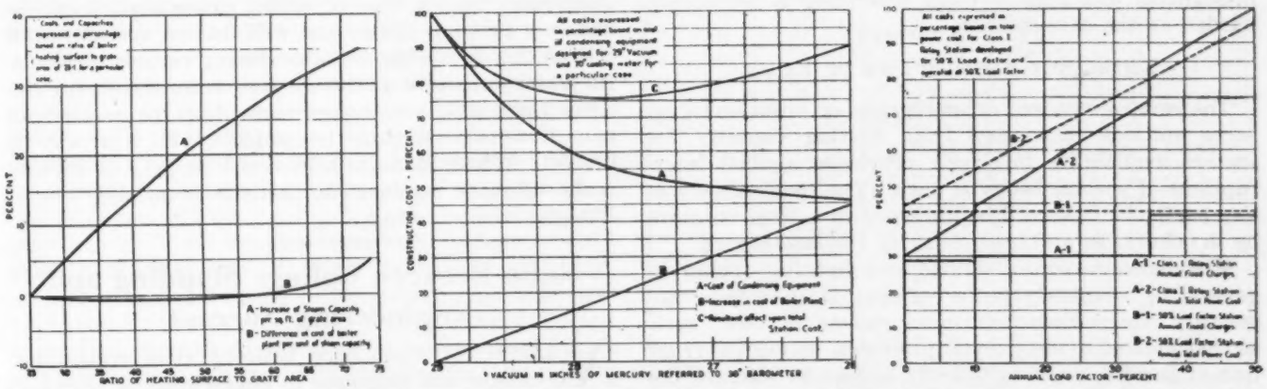
These two charts, Figs. 4 and 5, are correct as to detail for the particular conditions only for which they were estimated, but they clearly illustrate the interdependence of equipment costs and the importance of taking all related factors into account in deciding upon the type and size of apparatus. Similar considerations should be applied to the selection of generating units and to the determination of steam pressure and temperature.

It will usually be found advantageous to provide electric drive for one complete set of essential auxiliaries to permit starting these without waiting for steam. Instrument equipment for mechanical apparatus such as boilers and condensers should be complete in so far as required as guides to efficient combustion, not because low fuel rate is of special importance in this service but that it is an essential to the attainment of maximum output.

RELAY STATIONS FOR HIGHER LOAD-FACTOR CONDITIONS

If the period of relay station operation is permanently lengthened the higher load factor attained thereby may justify greater consideration of actual operating economy, condensing equipment may be of more liberal design and boiler capacity may be added in greater ratio to steam demand, thus permitting reduction of combustion rates.

Further growth of load and extension of the operating period for the relay station into the conditions of class III will justify still further consideration of operating economy in new equipment. When the conditions of class IV are reached practically the same factors govern as in the usual independent type of central station. If properly designed in the first instance, the low load-factor relay station may be readily converted to a high load-factor station and should operate with but a fraction higher total costs than the station specially designed for the higher load factor. The reasons for this are chiefly: First, boilers and furnaces properly designed for class I relay service are of very efficient type, being driven to extreme ratings only under the low load-factor conditions. Second, the class I low load-factor relay station should include no reserve capacity in generating units beyond that actually required to carry the anticipated maximum demand. Growth of load factor to proportions where operating economy becomes of importance in design, even though unaccompanied by growth in demand, will call for the addition of reserve equipment as a measure of insurance. Such a new unit with its auxiliaries may be designed for whatever degree of economy is warranted and may then be operated to take the base of the relay load. Third, more efficient auxiliaries may be introduced for the older units; as, for example, larger capacity and more efficient circulating pumps on the condensers and increased cooling facilities where spray ponds or cooling towers are employed.


PERCENT
A
B
A-Increase of Steam Capacity per sq.ft. of grate area
B-Differences in cost of boiler plant per unit of steam capacity
RATIO OF HEATING SURFACE TO GRATE AREA
CONSTRUCTION COST - PERCENT
All costs expressed as percentage based on cost of condensing equipment designed for 29" Vacuum and 70° cooling water for a particular case
C
A-Cost of Condensing Equipment
B-Increase in cost of Boiler Plant
C-Resultant effect upon total Station Cost
VACUUM IN INCHES OF MERCURY REFERRED TO 30" BAROMETER
PERCENT
B-2
A-2
B-1
A-1
A-1 - Class I Relay Station Annual Fixed Charges
A-2 - Class I Relay Station Annual Total Power Cost
B-1 - 50% Load Factor Station Annual Fixed Charges
B-2 - 50% Load Factor Station Annual Total Power Cost
ANNUAL LOAD FACTOR - PERCENT

FIGS. 4, 5 AND 6—BOILER-PLANT CONSTRUCTION COST AND CAPACITY AS AFFECTED BY RATIO OF BOILER-HEATING SURFACE TO GRATE AREA; RELAY STATION CONSTRUCTION COSTS AS AFFECTED BY CAPACITY OF CONDENSING EQUIPMENT; ANNUAL POWER COSTS OF STEAM RELAY STATION AS AFFECTED BY LOAD FACTOR FOR WHICH PLANT IS DESIGNED

The power costs for two types of station operating on the same conditions of load are shown in Fig. 6. Station *A* is designed initially for relay service under class I conditions. Improvement in load factor is accompanied by the installation of such additional equipment and of such economic characteristics as may be warranted. Station *B* is designed for continuous operation at 50 per cent annual load factor. Its first cost is nearly 50 per cent higher than that of the initial step of station *A*, and while more economical at the load factor for which it is designed the higher efficiency of its equipment is insufficient to balance the higher fixed charge on the lower range of load factor. Accordingly, where there is doubt as to the actual load factor at which the relay station may be called upon to operate it will in general be advisable to design for the minimum probable load factor rather than risk unnecessary expenditure in providing for load conditions that may require years to attain.

If the fundamental design is right the initially high operating charges characteristic of the low load-factor station are readily outgrown, whereas the fixed charges, essentially higher for the high load-factor station, are inescapable and remain until amortized a permanent burden on the development.

EMERGENCY RESERVE TYPE OF RELAY

The service required of emergency or break-down reserve stations may vary from floating capacity for instant availability to merely providing against interruptions of several hours or days. The requirements in any particular case will be governed in a large measure by the character and importance of the load served.

Miscellaneous power service and lighting should in general be completely protected against more than momentary interruption. For some classes of power, such as that applied to electrolytic processes, longer interruption of service is not sufficiently serious to warrant the expense of full relay. On the other hand, an extensive direct-current network, such as found in large metropolitan cities, must be absolutely safeguarded against interruption, however brief.

When the steam relay station is to serve as an instantaneously available reserve the necessary excess capacity in generating units must be maintained on the line and actually under steam at all times. Station design to provide most economically for such service must afford, for minimum investment, a maximum of flexibility in capacity with minimum stand-by charges. Characteristics in equipment peculiarly favoring these requirements are:

1. Combination electric-steam drive on the larger auxiliaries, such as circulating pumps, and mechanical draft fans for the units operated as floating stand-by.
2. Turbo-generating units with direct-driven exciter and with overspeed-controlled steam bypass for turbine-blade cooling independent of normal governing valves.
3. High ratio of turbo-generator capacity in comparison with point of lowest water rate.
4. Wide flexibility with quick response in control of boiler output and rate of combustion.
5. High ratio in capacity of combustion equipment versus area of boiler heating surface.

The first two of the characteristics mentioned are of advantage chiefly where the steam station is used exclusively for relay. In this case they tend to reduce the stand-by fuel costs by permitting the reserve units to float on the hydraulic system with but negligible consumption of steam. The importance of the third characteristic is particularly evident in steam stations which normally operate in parallel with hydraulic stations. Under such conditions the excess capacity may be carried by the units under load without serious loss of operating economy. The fourth and fifth characteristics are essential to maximum service from the stand-by station under any condition.

Considering again the general characteristics and requirements of the steam relay station, the feature which should be regarded as secondary only to low construction cost and adequate dependability is that of low attendance requirements, and not merely for the non-operating period but for actual operation as well. With this object the design should tend to large units and, as far as compatible with thorough simplicity, to automatic control. Where feasible, combining the functions of distributing station with those of the hydraulic relay assists materially in holding down both construction costs and attendance for the relay station. It should be borne in mind, however, that maximum returns on the investment in any type of steam power station can be had only through skilled and well-trained operators. It is true that it is often possible during periods of plentiful water supply to distribute men from the steam stations through other departments, but the number of men that may actually be employed in this way is limited. Where men are held over long periods without really effective employment there is invariably loss of efficiency and of morale.

Ratio Between College Standing and Engineering Success

A CLOSE correspondence between good scholarship in college and eminence in engineering is shown in an investigation made under the auspices of the American Association of Collegiate Registrars by Prof. Raymond Walters of Lehigh University, who presents a report in the current issue of *School and Society*. It was found that among 392 distinguished engineers, graduated from seventy-five technical schools, colleges and universities, 182, or 46.4 per cent, stood in the highest fifth of their classes scholastically upon graduation; 109, or 27.8 per cent, stood in the second highest fifth; 72, or 18.3 per cent, in the middle fifth; 14, or 3.6 per cent, in the next to lowest fifth, and 15, or 3.8 per cent, in the lowest fifth. Figures for a group of 189 alumni of five Eastern engineering schools were somewhat different in the upper classes, the second highest scholastic fifth having the largest percentage. In all groupings of the eminent engineers there were less than 4 per cent in each of the two lowest scholastic fifths.

Of 730 names on the Registrars' Association list of distinguished engineers virtually 80 per cent were found to be collegiate graduates, 16 per cent men of secondary school education and practical training, and less than 5 per cent men who started in college but did not finish. The arbitrary basis of eminence in this study of a professional group was taken to be the holding of office, membership on important committees and service as representatives of the four "founder" engineering societies—civil, mechanical, electrical, and mining and metallurgical—for five years, 1915-1919.

Simple and Compact Hydro Station*

Considerations that Influenced Layout and Equipment of 50,000-Hp. Station Erected on Steep Mountainside in San Joaquin Valley with Outdoor Transformers and Switches

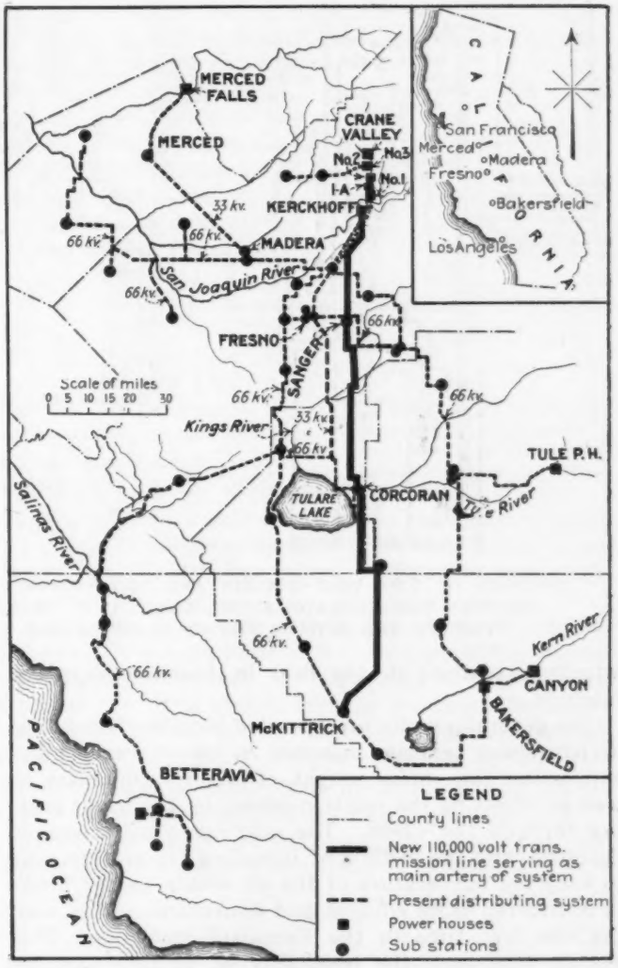
By R. C. STARR
Construction Engineer San Joaquin Light & Power Corporation, Fresno, Cal.

FACTORS which were taken into consideration in designing the hydraulic portion of the 50,000-hp. Kerckhoff development on the San Joaquin River and methods which were employed in hastening the construction to relieve a power shortage resulting from postponement of such work during the war were discussed in the Feb. 26, 1921, issue of the ELECTRICAL WORLD. Among the subjects considered were the power available, most economical and quickest way of providing storage, method of drilling a 17,000-ft. tunnel in which a speed of 453 ft. a month was attained, method of bringing construction materials to a site which was difficult of access and factors determining dimensions of surge chambers. In the current number attention is directed to considerations involved in laying out and equipping the generating station as distinguished from the hydraulic portion.

The power house is in a box canyon through which the San Joaquin River flows and is made of reinforced concrete. It has 100 ft. x 36 ft. (30 m. x 10.8 m.) floor space and is 70 ft. (21 m.) high. The unusually small floor space provided for three units of such large capacity is rather striking and causes considerable comment, but all the equipment is so compactly built and placed that there is ample room in the building for all purposes. In fact, the design is a striking example of compactness, efficiency and economy in every way and is credited to the power company's construction department on this project, of which B. F. Jakobsen was chief designing engineer. The building is built into the solid granite side of a mountain, and access thereto is obtained by an inclined railway 1,000 ft. (305 m.) long with a maximum grade of 100 per cent. A retaining wall extending 15 ft. (4.5 m.) above the floor forms the lower part of the river-side of the building and serves to protect the machinery from the maximum high water which could be caused by a flood due to a drift jam or other causes below the power house.

The maximum floods will raise the river approximately 30 ft. (9 m.) for short periods, and stop logs are raised in the tailraces so that it is possible to pump the waterwheels out by means of drains in the waterwheel pit to a sump, no matter what the elevation of the water in the river may be.

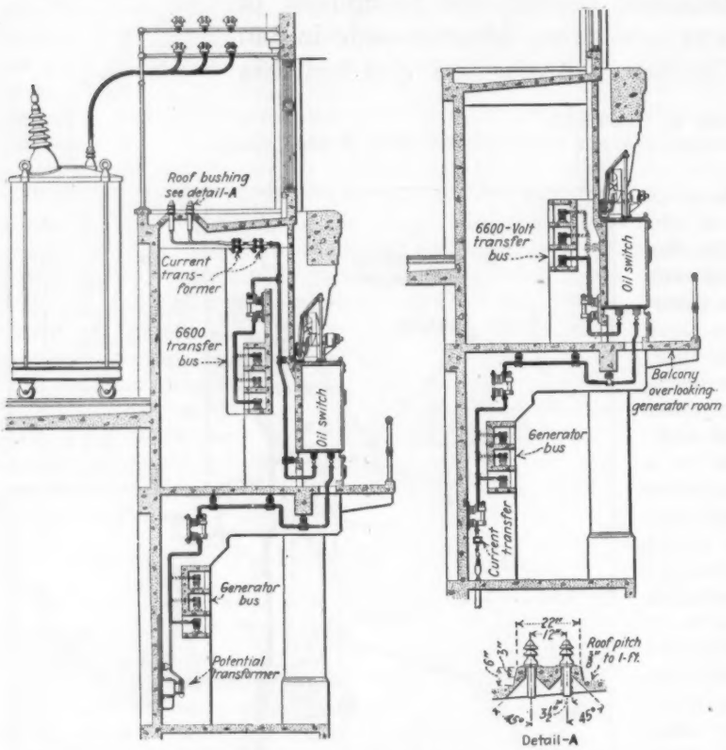
The building, from floor to roof, was constructed in thirty-seven days, and the crane was installed while forms were still under the roof. During this same period two of the waterwheels were erected and grouted in. The most important factor determining the total generating capacity was the economical development of the water resources of the power site. This involved the comparative costs of a large and a small tunnel and the comparative speed with which the two could be driven. After all these factors had been thoroughly analyzed, a plant capacity of approximately 55,000 hp. at full load was chosen. The equipment consists of three 15,000 hp., 360-r.p.m. vertical-shaft, single-runner, Francis-type turbines, designed for an effective head of 315 ft. and directly connected to 14,200-kva., 6,600-volt, 60-cycle, three-phase generators; two 500-hp. turbines of similar type running at 900 r.p.m. and directly connected to 300-kw., 250-volt exciters with 15-kw., 125-volt control-current generators mounted on top. Ventilation of the generators is accomplished by taking air from the room at the top and from the turbine cavern below and discharging it out through the sides of the stator's frame into a sheet-steel casing which surrounds the yoke and conducts the air outdoors, openings being provided for warming the power house in the winter.



KERCKHOFF IS AT THE NORTHERN END OF A 110,000-VOLT TRUNK LINE THAT RUNS DOWN SAN JOAQUIN VALLEY AND SERVES AS ARTERY TO EXISTING DISTRIBUTION SYSTEM

*Conclusion of article entitled "Hydro-Electric Plant Built in 15 Months." See page 471, Feb. 26, 1921, ELECTRICAL WORLD.

Special credit should be given the Allis-Chalmers erectors for installing the complete hydraulic, generator and exciter equipment in less than ninety days, the first twenty days being devoted to erecting two waterwheels without the aid of the crane. Allis-Chalmers winders



FEATURES OF 6,600-VOLT CIRCUITS AND CELL CONSTRUCTION BETWEEN THE GENERATOR BUSES, OIL SWITCHES, TRANSFER BUS AND OUTDOOR STEP-UP TRANSFORMERS

wired the stators in the field in fourteen days per machine.

The generator units are operated with the latest type of Kingsbury bearings mounted on top of the unit and supporting the entire weight of the rotating part as well as offsetting the reaction caused by the water passing through the wheel. The bearings were especially designed, and the method of installing the cooling coils to keep the temperature of the oil within proper limits is considered more efficient and economical and is used for the first time in the Kerckhoff machines. This system eliminates the possibility of foreign particles and scale from the pipes getting into the oil, which usually occurs when the oil is circulated through cooling coils; furthermore, it eliminates the necessity of expensive filters which would otherwise be required.

Complete Control from Switchboard

The governors are of the latest type, manufactured by the Allis-Chalmers Company, in which the governor weights are mounted on the main shaft and mechanically connected to the relay and floating valve which admit oil pressure to the gate-operating cylinders.

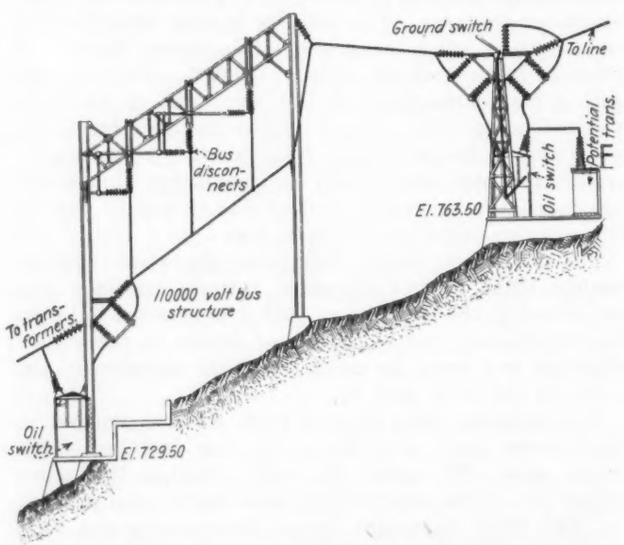
The main gates on both the main turbines and the exciter sets are electrically controlled from the switchboard, so that the machines may be started up and brought up to speed directly by the switchboard operator. The main waterwheel units are provided with pressure-relief valves which are operated automatically by the governor or by an excessive increase in pipeline pressure due to surges during load changes.

The main-control switchboard consists of a General Electric benchboard with pedestal-type Tirrill voltage regulator. This was wired completely in the field in fourteen days by the employees of the San Joaquin Light & Power Corporation's construction department. Watt-hour meters and relays are placed on the back of the panels. Temperature-exploring coils are provided in the generator windings with indicators on the switchboard, enabling the operator to read temperatures of generators at any time.

Simple Bus and Switching Arrangement

The 6,600-volt system involves one main bus and a transfer bus which permits operating any generator directly connected to its bank of transformers on a unit system or through the bus to other banks if its bank is out of service. A switch is provided for separating the main bus into sections, from either side of which the station service may be taken. The generators and step-up transformers are protected by differential relays which open all switches to isolate the faulty apparatus. The generator and exciter-field rheostats and the generator-field switches are remote-controlled from the switchboard.

Nine step-up transformers rated at 5,000 kva. each are connected 6,600 delta to 12,700 Y in banks of three. No spare transformer is provided, as the capacity provided will permit putting the load of three generators on two banks without seriously overheating them. The units are out-of-doors but close to the power house building and are supported by concrete beams over catch basins so that oil from any of them will quickly run away. The high-tension switching structure consists of three bays of steel structures erected on the mountainside back of the power-house building. The braces and sup-

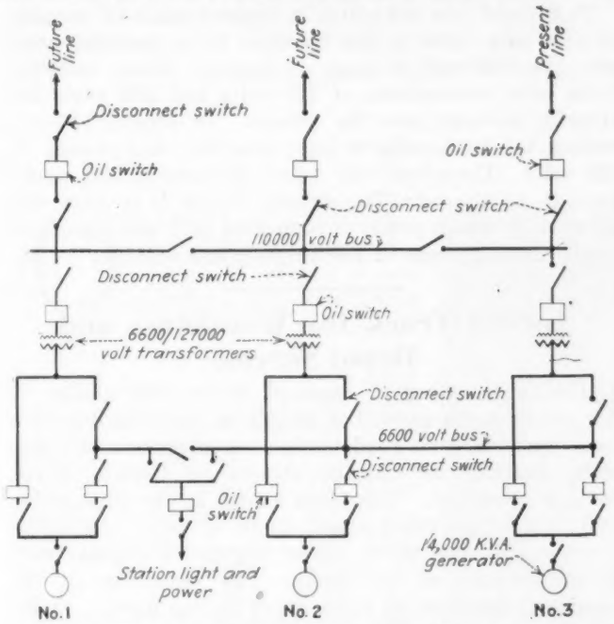


110,000-VOLT SWITCHING EQUIPMENT ON MOUNTAINSIDE BACK OF KERCKHOFF STATION

porting trusses are at an angle of 45 deg. and parallel to the slope of the mountainside. The high-tension buses are also in a plane of 45 deg., this being necessitated by the nature of the ground. Kelman high-

tension switches of the four-break type are used on the 127,000-volt circuits and are equipped with Ohio Brass compound-filled bushings.

The 110,000-volt tranmission line is approximately 110 miles (177 km.) long, extending from the Kerckhoff



SIMPLE SWITCHING ARRANGEMENT THAT AFFORDS EXTREME FLEXIBILITY OF OPERATION

power house to Sanger and Corcoran and later to McKittrick, connecting with the steam generating station at Bakersfield. The conductors are of aluminum cable having a cross-section of 266,000 circ.mil and are spaced 10 ft. (3 m.) apart and insulated with seven insulator disks at suspension points and eight at strain positions. The poles are 60-ft. (20-m.) cedar and have channel-iron cross-arms of the wishbone type. Poles are spaced about 580 ft. (176 m.) and have creosoted butts.

Railroad Electrification in France

THE work of electrifying certain French railroads, which started in 1920, has made rapid progress. The Midi company, for instance, has 150 km. of double-track electric line in operation, and the work of electrifying 3,000 km. additional is actually in progress. The reconstruction of two hydro-electric plants, which will furnish 150,000 hp. each to this road, is nearly completed. The road has placed orders for fifty new electric locomotives of the type used by the Chicago, Milwaukee & St. Paul Railway. Two other French railroads have undertaken the electrification of sections of their lines—the Orléans, which is electrifying 3,000 km., and the "P. L. M.," which is electrifying the same extent of track. The electric power for the Orléans road will be furnished by the waterfalls of the Upper Dordogne and that for the "P. L. M." by the falls of the French Alps.

The cost of electrifying these railroads will be in the neighborhood of 5,000,000,000 francs. The saving in coal will exceed 3,200,000 tons per annum, which, supposing the price of coal per ton to be above or equal to 100 francs, will, at the current rate at which money may be borrowed in France for such work, more than pay the interest on electrification bonds issued.

Standardizing the Distribution Voltages in Switzerland*

Alternating-Current Voltages of 125, 220 and 380 Decided Upon, While 110, 220 and 440 Volts Will Be Used for Direct Current

BY A. GRÜNHUT
Editor *Elektrotechnik und Maschinenbau*, Vienna

GREAT strides toward the standardizing of voltages have been made by the Swiss Electrotechnical Society. It has been considered wise to standardize first the low voltages, and in planning this such voltages have been decided upon as make it possible to maintain existing transformers, motors and other apparatus, making them suitable for the new voltage by rearranging or reconnecting their windings. In establishing voltage standards the three-phase system has been mainly considered, as direct-current plants are very scarce in Switzerland. One possibility is to subdivide a transformer winding into six half coils each, together with phase and Y voltage, with delta, Y and zigzag connections, giving voltages of $1:\sqrt{3}$ and of $1:2:3$. The most suitable ranges for three-phase systems have been found to be as follows: (1) 220/380 volts; (2) 250/440 volts; (3) 145/250 volts.

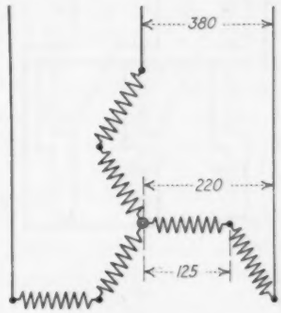


FIG. 1 — CONNECTIONS OF STANDARD DISTRIBUTION TRANSFORMER ADOPTED IN SWITZERLAND

A circular letter sent out to the power plants did not result in a definite decision. In general the second system has been found too high, and as between the first and the third system opinion was more favorable toward the first. It was suggested that for special purposes a lower and a higher limit be established. The first could be obtained by division by $\sqrt{3}$ (125 or 145), the latter by multiplication by 2 (760 or 880).

The Swiss Electrotechnical Society laid before its members the following alternatives to select from:

		Volts	Volts	Volts	Volts
I.	A.C.	125	220	380	760
	D.C.	110	220	440	500
II.	A.C.	145	250	440	880
	D.C.	125	250	500	750

At a general meeting held June 5, 1920, at Lucerne, the majority decided for the first alternative. It was therefore resolved to adhere in future in all plants to the voltages of 125, 220 and 380 for alternating current and 110, 220 and 440 for direct current.

The exact reasons why the members finally settled on system I are not known. It may be assumed that the old-established 125-volt systems were conservatively adhered to, that a large number of rural 220/380-volt lines are in existence, that lamp factories have standardized lamps of 110 volts and 220 volts and do not want to take up a third type, and, finally, that electrical factories can easily change a transformer from 125/220 volts and 145/250 volts to the new standard of 220/380 volts. The standard transformer of the future will

*Prepared exclusively for the ELECTRICAL WORLD.

have a Y primary and a zigzag secondary, as shown in Fig. 1. The association of the Swiss electrical manufacturers suggested for the interim a subdivided transformer winding according to Fig. 2.

For motors now connected to 250 volts a change over to 380 volts may be made by a winding of about 235 volts delta, corresponding to 410 volts Y. Motors with six poles may be divided in three groups for 250

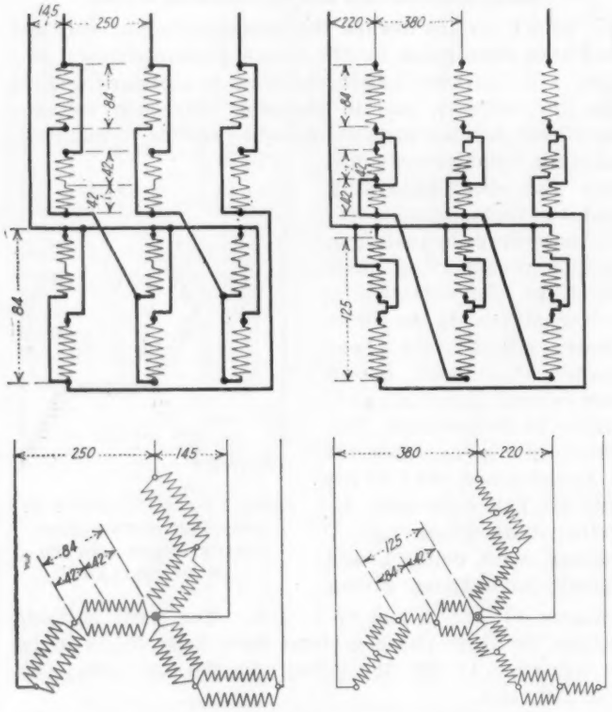


FIG. 2—SUGGESTED BY SWISS MANUFACTURERS FOR USE WHILE STANDARD IS BEING ADOPTED

volts and in two groups for 380 volts. Twelve-pole motors may be divided in a similar way. The future standard for motors will be 125/220/380 volts and must be of simplest construction, suitable for Y 220/380 volts and changeable to 125/220 volts.

At the next meeting the upper standards (760 volts alternating current and 500 volts direct current) will be discussed further.

Statistical records of the electric power plants of Switzerland for the year 1916-1917 show that in the existing 163 plants, with a total rating of 600,000 kw., thirty-six different distribution voltages are used. The widest use is made of 125 volts and 127 volts. Twenty-four per cent of all illumination, making up 38½ per cent of the total load, is fed with this voltage.

Second in rank for lighting is found 140 volts and 145 volts, totaling 18½ per cent of the output, while within the range of 218 volts and 225 volts 8½ per cent of the output is transmitted. Of all the connected motors, 35½ per cent of the load is 500-volt, three-phase; 27 per cent is 240 volts and 250 volts. A large use is made of three-phase voltages of 145/250 and 125/220, where motors are connected to the 250-volt and 220-volt wires and illumination to the phase voltage, 145 and 125.

For the distribution of larger amounts of power, such as are frequently used for agricultural purposes, 110 volts and 125 volts are too low, 220 volts phase and 380 volts having been found more suitable.

The climbing prices of gas made electric cooking very popular, which in turn made a higher voltage in the residential districts desirable. On a 110-volt line, as a rule, one hot plate at the most at 800 watts may be connected to the house wiring, which is not enough for cooking.

To connect two hot plates is impracticable on account of a 10-amp. fuse in the circuit. It is possible, however, on 220-volt wiring. In many house installations cable connections of 220 volts and 380 volts are already brought into the cellars. In others 110-volt wiring is made, with a later possible change-over to 220 volts. Therefore only a few old installations would have to be altered. The general desire is to have one network in which power is connected in Y and light and small heating loads to the single-phase voltage.

Special Truck for Warehouse and Depot Service

READY handling in confined spaces and ability to turn on the ground it stands on are features of a three-wheel electric road truck used in depot and warehouse hauling on Chicago streets by Carson, Pirie, Scott & Company. The truck shown in the illustration is driven by the front wheel, inside of which the motor is mounted. The motor pinion engages a circular rack on the interior of the wheel. The remainder of the chassis is made up of stock truck trailer parts. Steering is accomplished by turning the front wheel, the connection between the steering column and the wheel being by means of a pinion on the lower end of the column which engages a circular rack. The elimination of steering knuckles, differentials, chain drive and auxiliary parts reduces the motor and drive mechanism to the simplest possible form and eliminates the maintenance expense that the presence of these parts would incur. The truck has been in use for two years in place of the teams formerly employed. It was originally developed from an old horse-drawn truck, the motor wheel and battery having been attached to the truck for experimental purposes. Loads of four and five tons are

THREE-WHEEL ELECTRIC ROAD TRUCK FOR WAREHOUSE AND DEPOT HAULING

handled, and in nearly 12,000 miles of travel no tendency to upset has been observed. Its maneuvering ability has proved superior to that of the four-wheel truck. R. Macrae, electric vehicle engineer of the Commonwealth Edison Company, developed the motor wheel, which is the vital part of the truck and gives the possibility of use in confined spaces.

How 3,000 Southern Homes Were Wired—I.

Details of the Sales Plan, the Training of the Salesmen, Actual Cost of Contracts Obtained and the Combination of Advertising and Sales Efforts that Has Produced Best Results

By L. J. WILHOITE
Lighting Contract Agent Chattanooga Railway & Light Company

ON JAN. 1, 1919, according to the Chattanooga city directory, there were 21,571 families within that uncertain geographical domain referred to by our engineering friends as "our service districts." Twenty per cent of the population of Chattanooga, according to the city directory, are colored folks. We therefore concluded that about 17,256 white families were residing in our service districts on Jan. 1, 1919. Upon looking at our customers' ledgers we found that there were 9,673 residence connections. There were thus at that time 7,483 white families without the comforts and conveniences of electric service. In our arithmetical calculations we unceremoniously put the "colored brother" into the so-called unavailable class. This we found to be an entirely unjustified and unwarranted indictment of his progressiveness.

L. J. WILHOITE

As the sales engineer would say, we had on Jan. 1, 1919, a customer saturation of approximately ninety per 1,000 of population, although, according to the presumably unassailable statement of the leaders of the industry as reported in the proceedings of the National Electric Light Association, the possible saturation per 1,000 of population is around 200. When we compared our actual figure of ninety per 1,000 with this possible figure of 200 per 1,000 we decided that it was high time to get out after business. The only consolation that we had to fall back on for our poor record was the doubtless illogical supposition that the authorities who had figured out the 200 per 1,000 index to customer saturation had never spent much time in a community where much of the population ranges in color from light brown to bituminous. However, after making all due allowances for the color range and other probable ineligibles, we concluded that our possible wired houses per 1,000 should register around 128. While this figure was perhaps a trifle low, it made our actual saturation of ninety per 1,000 look bigger and kept us from feeling that the last eight years had been spent entirely in vain.

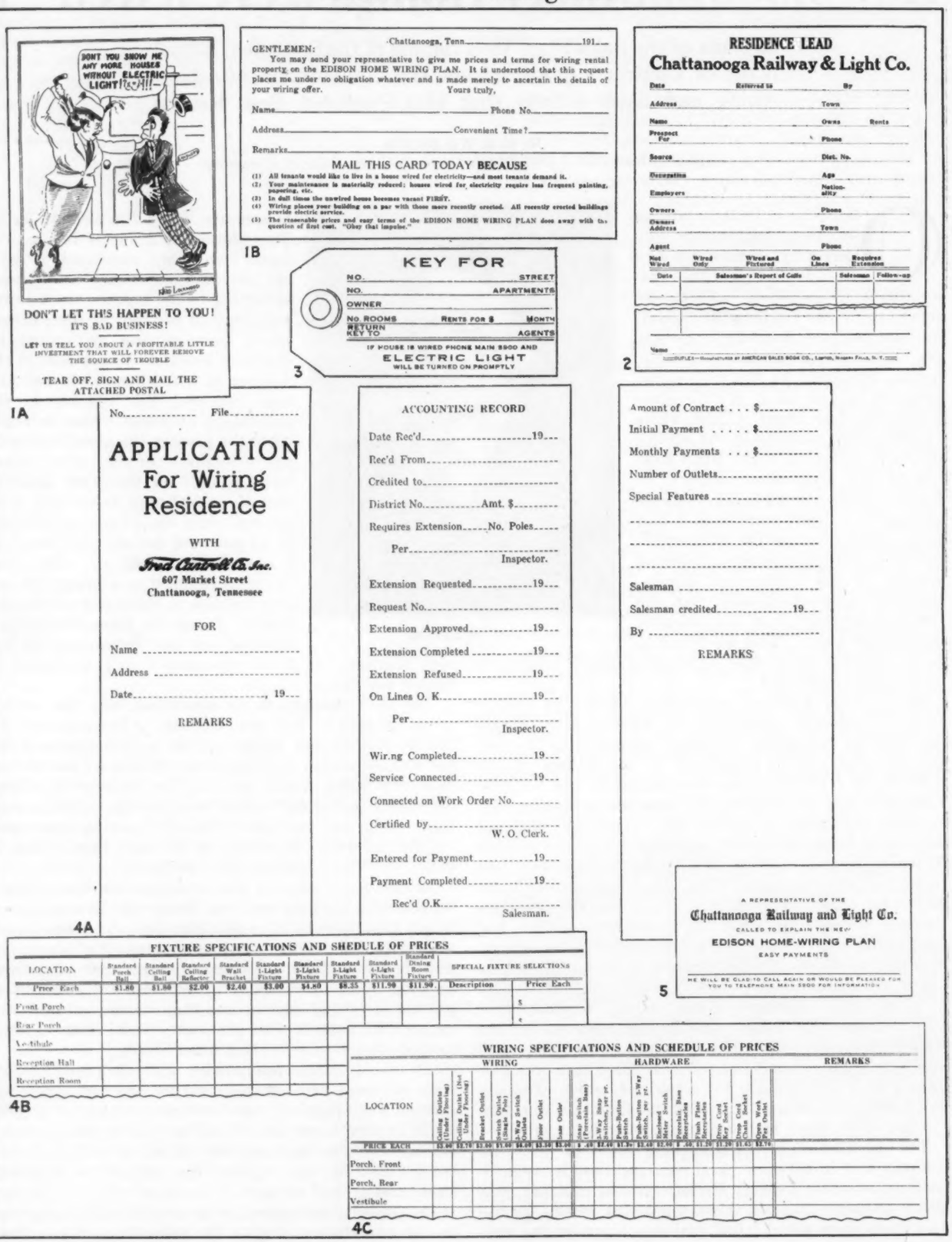
The population of Chattanooga, together with its suburbs and in-between rural communities, is, regardless of Uncle Sam's stingy statistics to the contrary, just about 107,000. That is, it was on Jan. 1, 1919. Therefore there were about 4,066 available house-wiring contracts which should earn a central station approximately $80,000 per annum. At this point we again referred to the reports of the National Electric Light Association and there discovered that only about 20 per cent of all houses are wired for electric lights. This statement made us feel a little better when we compared it with our own 43.3 per cent. Furthermore, according to the reports, these towns with only 20 per cent of their houses wired were getting an annual increase of less than 10 per cent in the number of wired homes. It was further indicated that the higher the percentage of wired homes to begin with, the greater the annual percentage of increase per year, other things being equal. We therefore assumed that if an ordinary town with a 20 per cent start could enjoy an increase of 10 per cent per annum, certainly a town with a 56.7 per cent start ought to produce in a year a 25 per cent increase in number of old houses wired. Based on these calculations the goal set was therefore a 25 per cent increase, or 2,416 old-house-wiring contracts in twelve months.

The next question to be considered was the method to be adopted in this new business. The company did not do wiring and would not do it; the company did not finance wiring and would not finance it; contractors said they really didn't care for the business of wiring old houses and couldn't afford to do wiring on the installment plan, and we knew that our possible customers couldn't afford to do wiring on the cash plan. This, in brief, was the situation that was faced.

At this point some of the amusing experiences which we had with the local electrical fraternity in our attempt to get them interested in participation on an equal basis would be interesting. But this is another story and shall be passed with the bald statement that after three or four weeks were spent in unsuccessful attempts to get the electrical men in line they simply refused—for reasons, we suspect, that are pretty well known to every central-station man in the United States.

All through these preliminary diplomatic negotiations with the local firms that do wiring one contractor had evinced a willingness to do business, and as nobody else cared to accept our service as free selling agents unless we financed the business, we signed up with this contractor and agreed to give him our moral, business, social and ethical support on house wiring for the year 1919. Briefly, we agreed to assume all selling expense, do the advertising, employ the salesmen and pay them and hand the business to him all signed up ready to be worked. He agreed to do the wiring promptly and in a satisfactory manner on the deferred-payment plan, assuming all credit risk and collecting the money.

Advertising Material, Contract Forms and Follow-up Blanks Used in the "Edison Home-Wiring Plan"


DON'T YOU SHOW ME ANY MORE HOUSES WITHOUT ELECTRIC LIGHT!!—All!—
DON'T LET THIS HAPPEN TO YOU!
IT'S BAD BUSINESS!
LET US TELL YOU ABOUT A PROFITABLE LITTLE INVESTMENT THAT WILL FOREVER REMOVE THE SOURCE OF TROUBLE
TEAR OFF, SIGN AND MAIL THE ATTACHED POSTAL
1A
GENTLEMEN: Chattanooga, Tenn. 191
You may send your representative to give me prices and terms for wiring rental property on the EDISON HOME WIRING PLAN. It is understood that this request places me under no obligation whatever and is made merely to ascertain the details of your wiring offer. Yours truly,
Name Phone No.
Address Convenient Time?
Remarks
MAIL THIS CARD TODAY BECAUSE
(1) All tenants would like to live in a house wired for electricity—and most tenants demand it.
(2) Your maintenance is materially reduced; houses wired for electricity require less frequent painting, papering, etc.
(3) In dull times the unwired house becomes vacant FIRST.
(4) Wiring places your building on a par with those more recently erected. All recently erected buildings provide electric service.
(5) The reasonable prices and easy terms of the EDISON HOME WIRING PLAN does away with the question of first cost. "Obey that impulse."
1B
KEY FOR
NO. STREET
NO. APARTMENTS
OWNER
NO. ROOMS RENTS FOR $ MONTH
RETURN KEY TO AGENTS
IF HOUSE IS WIRED PHONE MAIN 8900 AND
ELECTRIC LIGHT
WILL BE TURNED ON PROMPTLY
3
RESIDENCE LEAD
Chattanooga Railway & Light Co.
Date Returned to By
Address Town
Name Owns Rents
Prospect For Phone
Source Dist. No.
Occupation Age
Employers Nationality
Owners Phone
Owners Address Town
Agent Phone
Not Wired Wired Only Wired and Fixtured On Lines Requires Extension
Date Salesman's Report of Calls Salesman Follow-up
2
No. File
APPLICATION
For Wiring
Residence
WITH
Fred Cantrell Co. Inc.
607 Market Street
Chattanooga, Tennessee
FOR
Name
Address
Date , 19
REMARKS
4A
ACCOUNTING RECORD
Date Rec'd 19
Rec'd From
Credited to
District No. Amt. $
Requires Extension No. Poles
Per Inspector.
Extension Requested 19
Request No.
Extension Approved 19
Extension Completed 19
Extension Refused 19
On Lines O. K. 19
Per Inspector.
Wiring Completed 19
Service Connected 19
Connected on Work Order No.
Certified by W. O. Clerk.
Entered for Payment 19
Payment Completed 19
Rec'd O.K. Salesman.
Amount of Contract . . . $
Initial Payment . . . . . $
Monthly Payments . . . $
Number of Outlets
Special Features
Salesman
Salesman credited 19
By
REMARKS
A REPRESENTATIVE OF THE
Chattanooga Railway and Light Co.
CALLED TO EXPLAIN THE NEW
EDISON HOME-WIRING PLAN
EASY PAYMENTS
HE WILL BE GLAD TO CALL AGAIN OR WOULD BE PLEASED FOR YOU TO TELEPHONE MAIN 8900 FOR INFORMATION
5
FIXTURE SPECIFICATIONS AND SHEDULE OF PRICES
LOCATION | Standard Porch Ball | Standard Ceiling Ball | Standard Ceiling Reflector | Standard Wall Bracket | Standard 1-Light Fixture | Standard 2-Light Fixture | Standard 3-Light Fixture | Standard 4-Light Fixture | Standard Dining Room Fixture | SPECIAL FIXTURE SELECTIONS Description | Price Each
Price Each | $1.80 | $1.80 | $2.00 | $2.40 | $3.00 | $4.80 | $8.35 | $11.90 | $11.90 | |
Front Porch
Rear Porch
Vestibule
Reception Hall
Reception Room
4B
WIRING SPECIFICATIONS AND SCHEDULE OF PRICES
WIRING | HARDWARE | REMARKS
LOCATION | Ceiling Outlets (Under Flooring) | Ceiling Outlet (Not Under Flooring) | Bracket Outlet | Switch Outlet (Single Pole) | 3-Way Switch Outlets | Floor Outlet | Base Outlet | Key Socket | Push-Button Switch | Push-Button 3-Way Switch, per pr. | Enclosed Meter Switch | Porcelain Base Receptacles | Flush Plate Receptacles | Drop Cord Key Socket | Drop Cord Chain Socket | Base Work Per Outlet
PRICE EACH | $2.00 | $2.70 | $2.00 | $1.00 | $2.00 | $3.30 | $3.00 | $ .40 | $2.40 | $1.20 | $3.40 | $2.00 | $ .60 | $1.20 | $1.20 | $1.45 | $2.70
Porch, Front
Porch, Rear
Vestibule
4C

1A and 1B—Strenuous appeal in the form of a return post card sent to the landlords of unwired houses.

2—Prospect slip used in the salesmen's follow-up system.

3—Key tag. The real estate men used a large quantity of these, as it saved them printing cost.

4A—Three-panel cover of wiring contract, which provides space for the accounting and sales departments' records of transaction. Contract is folded for convenience in handling and in filing.

4B—Page 2 (inside) of wiring contract form giving fixture specifications and schedules of prices.

4 C—Page 3 (inside) of wiring contract form with wiring specifications and schedule of prices.

5—How salesman's calling card was utilized to advertise the "Edison Home-Wiring Plan."

With this working agreement completed, we started in to get advertising matter printed, mailing lists compiled, newspaper copy ready and salesmen hired and trained for the campaign. The following displayed advertisement was inserted in a 30-in. space in the Sunday morning paper: "Wanted—Large local corporation requires the services of seven men capable of earning on a combination salary and commission basis from $200 to $250 per month. Address, giving full experience, reference and present employment, Box 90, care Times." From the responses this advertisement brought us twenty-four of the applicants were notified by letter to meet us and talk the matter over. Twenty came as requested. The time was 8 o'clock in the evening at our company's office. Those who came early were requested to be seated and those who came late found the door locked. Of course, nobody expected to see the others and each naturally regarded his neighbor with more or less suspicion. In an hour the plan was unfolded to them and each knew it much better than if time had been wasted in interviewing them separately. "Now, gentlemen," we concluded, "you know what the job is that we propose to do. You know what it will pay you if you can deliver it. You know that you will starve to death if you don't deliver it. Starting promptly at 8 o'clock tomorrow night and continuing thereafter every night for five nights, we are going to tell you how this job is going to be done. If you are interested, be here. If you are not interested, don't waste your time and ours. Attendance here does not obligate us to give you a job, and neither does it obligate you to take one if we should offer it to you. The question of jobs will be decided after the fifth night. We hope to see all of you tomorrow night at 8 o'clock."

The five evenings that followed proved to be the meeting time for a lively class in "how to do house wiring." Several of our own men from other departments, as well as our sales force and the electrical contractor's men, were present at these meetings in addition to the usual quota of canvassers, and we had with all of them a very pleasant and profitable time. On the last evening we closed our house-wiring course with a statement something like this: "Boys, you know pretty well now what we want. You know what it will take to get it. If you think you have got what you think it takes to get it, fill out one of these applications and leave it here with us. If we agree with you, you will hear from us tomorrow." Ten applications were left with us.

TYPES OF SALESMEN SELECTED

Going to school with these men for a week had given us a pretty fair idea as to whom we ought to hire out of the group. From the ten applicants we selected seven and requested them to report for work the following day. The experience of these seven men in our business was limited to what had percolated into them during six strenuous sessions of about one hour each. The line-up and the final outcome is indicated in the following tabulation.

Salesman No. 1.—Former detective and correspondence course salesman; age fifty, nationality French; now holds the world's record on house wiring.

Salesman No. 2.—Former wholesale liquor dealer (who saw the handwriting on the wall); age thirty-nine, Jewish; now holds the second world's record.

Salesman No. 3.—Former tobacco salesman; age unknown, nationality American (Georgia); not meteoric but a constant business getter.

Salesman No. 4.—Former adding machine, dictaphone, iron-safe and calculator salesman; age thirty-three, nationality Irish; a regular business whirlwind when right, but a barely perceptible zephyr when otherwise—a sort of "get-them-when-the-other-fellow-couldn't."

Salesman No. 5.—Former sailor in the United States Navy and a general all around ladies' man; age twenty-nine, nationality plain American; a salesman with strong parlor influences.

Salesman No. 6.—Former college man, an athlete; age twenty-eight, nationality American (Chattanooga); later found to be suffering from sleeping sickness, hookworm and inertia.

Salesman No. 7.—Former clerk; age thirty-five, nationality completely melted; could find them but could not close them.

We wanted seven men because a good house-wiring salesman averages about twenty calls a day, including both his missionary and closing visits. House-wiring "prospects" ought to be called on at least once a month; otherwise they have a tendency to become decidedly satisfied with the wrong kind of light. We had thirty-eight good prospective customers to 1,000 of population, according to the city directory, so that one salesman, figuring twenty-six working days a month, could canvass 13,000 persons without difficulty and 15,000 under a little pressure. We also knew that all seven men would not bring in equal numbers of house-wiring contracts with the signatures affixed, and we decided that even if the city's population had been overestimated seven men would not be too many to start with.

The first day of the campaign was spent in giving the seven salesmen details of the job—not "how-to-sell-it" talk but simple elementary facts about the tools and how to use them. That evening every man left the office with a big bag that contained the following: (1) a supply of our standard lighting application forms; (2) a supply of house-wiring contracts; (3) business cards; (4) a set of photographs of fixtures to be used; (5) a supply of booklets telling all about the Edison home-wiring plan; (6) copies of all publicity material, including proofs of newspaper advertisements that would appear; (7) a convenient book of lead forms for reporting "prospects"; (8) estimating blanks; (9) "lead follow-up" book properly indexed; (10) order forms for application; (11) a bulletin binder for filing and retaining instructions to be issued from time to time regarding the work. The next day was spent in precisely the same manner, and many times thereafter reference was made to the same subject, the mechanics of the business. A salesman without tools and a complete knowledge of how to use them is worse off than a carpenter in the same fix, and a salesman with tools that he does not know how to use is worse off that either.

AGREEMENT WITH SALESMEN

In each man's bulletin binder was a summary of the conditions and agreement under which we were going to work. These printed rules saved a lot of argument in the future. Among many other things these stipulations set out the following conditions, which are briefly summarized here because they have proved of inestimable value in our work:

1. For his services from March 15 to April 1 each man would receive just $37.50; that was all.

2. For the first full month each man would have a guaranteed salary of $100, the second month $125, the third month $150, the fourth month $175, and each month thereafter $200.

3. During the first full month each man was expected to deliver not less than twenty old-house-wiring contracts, the second month not less than twenty-five, the third month not less than thirty, the fourth month not less than thirty-five, and each month thereafter not less than forty.

4. On each contract taken in excess of the required quota a commission of $5 would be paid regardless of the amount or size of the contract.

5. It was expressly understood that any man who failed to make his quota was out of a job forthwith unless for good and sufficient reasons we decided to give him a further trial. With arrangements like this the unpleasant business of discharging was taken care of automatically.

6. It was set out that the salesmen would receive full credit for all business coming from their respective districts regardless of whether or not they had had anything to do with signing the contract. This provided, of course, that the contract for wiring was placed with the Fred Cantrell Company, the contracting firm with which we had completed arrangements for handling the business. On business going to other contractors no credit would be allowed to the salesman under any consideration. This decision was necessary for obvious reasons, and incidentally it may be said that the regulation had the desired effect.

THE PRELIMINARY SURVEY

Our service districts were divided as equally as possible on a basis of prospective business. Each man was assigned to a territory and credit was arranged according to districts. When somebody broke over the fence he simply boosted his neighbor's average; therefore breaking over was infrequent. All salesmen were required to attend to their own knitting exclusively, and in their knitting bag they carried just one needle—"old-house-wiring contracts." They were not permitted to handle anything else, such as lighting, ranges, washing machines or other appliances. With this clear-cut understanding of the rules of the campaign, coupled with a fair knowledge of the tools to be used, along with six nights of house-wiring school instruction the men began to think in terms of house wiring.

The details of the preliminary survey, results of the campaign by months, costs per contract, value of the business secured, relative values of different phases of the campaign and general conclusions will be given in a second section of this article.

Progress in Reconstruction of French Light and Power Plants

CONSIDERABLE progress has been made in reconstructing the French electric light and power plants destroyed during the war, according to information received by the French High Commission in the United States.

Thirty-two plants were destroyed, which had a combined capacity in 1913 of 201,500 kw. out of a total in the devastated area of 300,000 kw. Since the armistice twenty-four of these plants, with a combined rating of 104,000 kw., have been rebuilt. It is expected that by spring all of the electric plants will again be in operation and with the new machinery will be rated at 322,000 kw.

Form 314

SALES DEPARTMENT

Salesman's Daily Report of Business Retained, Solicited and Secured ..... 19.....

Name (Business Closed)	Address	X	Class	Business	LIGHTING			MOTORS		APPLIANCES		Total 50 W. Equiv.	Rate
					Watts	Arcs	Incds.	No.	H. P.	Fans	Misc.		
X-Make √ Mark in Column if New Call	Totals												

UNSUCCESSFUL CALLS

Name (Not Closed)	Address	X	√	Business	Using	Remarks	Call Again
X-Make √ Mark if New Call							
√-Make X Mark if Customer							

COMPLAINTS INVESTIGATED

Name	Address	Nature of Complaint	Adjustment

No. Contracts Closed No. New Calls No. Old Calls

Total No. Calls Signed Salesman

SALESMAN'S DAILY REPORT FORM, WHICH THE AVERAGE SALESMAN DISLIKES TO FILL OUT, BUT WAS FOUND OF GREAT VALUE IN KEEPING THE WORK FROM LAGGING

Rural and Other Service Costs Compared

Analysis of Actual System Shows that Higher Investment Charge and Line Losses for Rural Service Make Cost Double that for Urban Service

UTILITY men have worried more over rates than over any of the other problems which affect the rural service situation. But the rate problems are dependent on the financing, construction and operating problems, and until those problems are satisfactorily solved the rate problem cannot be solved. Some utilities have tried to solve the rate problem first. The result, according to Prof. D. D. Ewing of Purdue University, has been confusion in both thought and results. Professor Ewing recently discussed the subject in a paper read before the Indiana Engineering Society and the Indianapolis-Lafayette Section, A. I. E. E., his conclusions being based upon an analysis of data obtained from an operating company serving rural communities.

On the basis of equal efficacy of investment and quality of service the ultimate cost of serving the rural consumer will be the same whether the lines be owned by the rural consumers or by a utility. In any event the cost of serving the rural consumer will be several times the cost of serving the urban consumer. This cost will be made up of (1) fixed charge, (2) consumer charge and (3) energy charge. All of these charges will be much higher than for the urban consumer. The investment, upon which the fixed charge largely depends, will be from four to twelve times larger. Because of the wide distribution of consumers the consumer charge will be from two to four times larger. As indicated in Table I, the energy lost in transit is likely to range from 40 to 60 per cent of the total energy supplied to the line at the power house. The energy charge, therefore, will be roughly twice that for the urban consumer.

TABLE I—CONSUMPTION DATA FROM RURAL LINES IN THE MIDDLE WEST *

Class of Service	Location	No. of Consumers	Average kw.-hr. per Month	Per Cent of Energy Loss	Remarks:
Village and farm	Indiana	372	24	54	Single line, 1919
Farm	Kansas	5	13	58	Single line, 1919
Farm	Wisconsin	146	29	..	Thirteen lines, 1919–20
Farm	Iowa	25	40	38	Single line, 1919–20
Farm	Ohio	25	30	45	Several lines, 1919–20
Farm	Ohio	300	15	..	Several lines, 1919–20
Village and farm	Wisconsin	738	40	..	Rural lines in Wisconsin Reported in 1917
Farm	Indiana	145	16	..	Several lines, 1915
Village	Indiana	74	11	..	Several lines, 1915

* This table, as well as Tables II, III and IV, is compiled from analyses made of actual rural lines in service. Tables II, III and IV are taken from the practice of an Indiana company and present some figures on rural service that are all too scarce. Note the manner in which rural service bulks large in line losses and comparative costs.

Rate practice for rural lines is in a state of dire confusion. Some companies charge rural consumers the urban rate. Such is the practice of the company in the small Indiana city whose consumer and service cost data are set forth in Tables II, III and IV. It will be noted that on the time-honored but seriously incorrect measure of service, namely, the kilowatt-hour, the cost of serving the rural consumer is nearly twice that of the urban consumer. The column headed "Investment" is really not investment but appraised value at cost of reproduction less depreciation, which is materially less than the original investment. It will be noted that the energy loss to the rural consumer was 54 per cent. The rural consumers are those receiving service from a 12-mile, 6,600-volt, single-phase transmission line, and a considerable number of them are villagers rather than farmers. The consumer's charge for rural consumers was undoubtedly much higher than for the urban consumers, but the accounting did not permit segregation of these charges. It may be here noted that there should be a distinction between the farmer and the villager.

TABLE II—RURAL LINE CONSUMER AND LOAD DATA AS COMPARED WITH OTHER CLASSES OF SERVICE

Class of Service	No. Consumers	Peak Load, Kw.	Per Cent Peak	Kw. Generated	Per Cent Total	Kw.-Hr. Sold	Per Cent Total Sold	Per Cent Kw.-Hr. Losses
Residence	2,293	250	20.8	790,000	28.4	650,000	27.9	17.6
Commercial	402	330	27.6	534,000	19.2	510,000	21.9	4.5
Municipal	1	80	6.6	372,000	13.4	334,000	14.3	10.2
Power	169	480	40.0	848,000	30.6	727,000	31.2	14.2
Rural	372	60	5.0	234,000	8.4	108,000	4.7	54.0
Totals	3,237	1,200	100.0	2,778,000	100.0	2,329,000	100.0	

On the basis of 7 per cent interest, 2 per cent taxes and insurance, 8 per cent maintenance and depreciation and $500 investment, the fixed portion of the cost of service would be $85 per year, or about $7 per month.

TABLE III—RURAL LINE INVESTMENT AND SERVICE COST DATA COMPARED WITH OTHER CLASSES OF SERVICE

Class of Service	Investment	Per Cent Total Investment	Cost of Energy: Fixed Charges	Consumer's Expense	Energy Expense	Total Cost	Investment per Consumer
Residence	$84,776	28.9	$15,900	$2,940.00	$19,550	$38,390	$37
Commercial	69,021	23.6	12,950	514.00	13,150	26,614	172
Municipal	29,747	10.1	5,580	1.28	9,130	14,721	29,747
Power	89,758	30.6	16,850	217.00	20,850	37,917	530
Rural	20,171	6.8	3,780	478.00	5.750	10,078	54
Totals	$293,473	100.00					

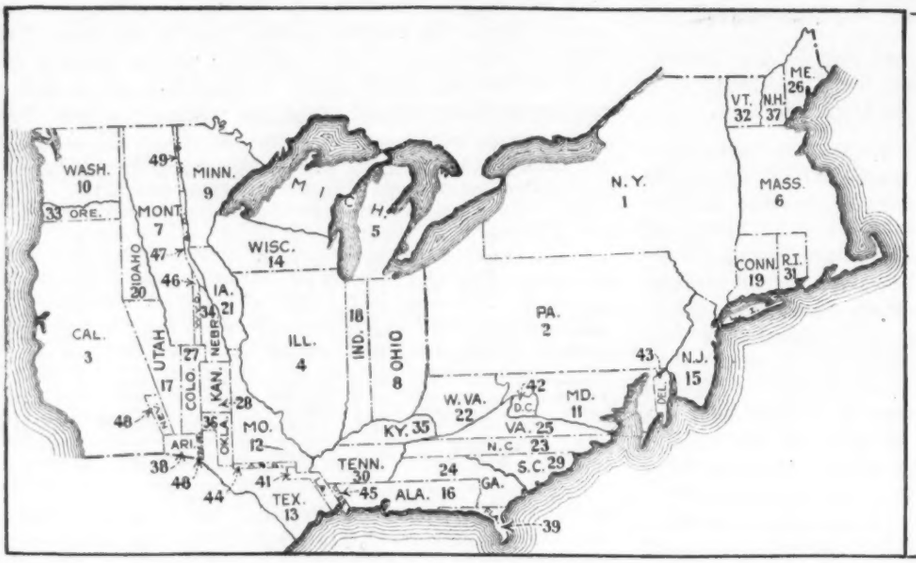
If the consumer prefers to carry his own investment and let the utility operate and maintain the line, the fixed cost would be about $30 per year, or $2.50 per month. Increasing the fixed cost by the portion of the energy charge incident to transformer core losses is practiced in a number of places. It seems to be a move in the right direction because the apparent energy charge will be reduced and the consumer will be induced to increase his consumption. A flat charge per year covering all energy consumption up to, say, 500 kw.-hr. is used in some places. Excess energy used is then charged for at a low rate. From the farmer's point of view Professor Ewing thinks this scheme a most excellent one.

TABLE IV—ELEMENTS OF COST OF SERVICE FOR RURAL LINES AS COMPARED WITH OTHER CLASSES OF SERVICE

Class of Service	Per Consumer Fixed Charges per Month	Consumer's Expense per Month	Energy Charge, Cents	Total Cost per Kw.-Hr., Cents
Residence	$0.578	$0.107	3.00	5.90
Commercial	2.69	.107	2.58	5.20
Municipal	46.50	.107	2.73	4.40
Power*	....	.107	2.87	5.20
Rural	.847	.107	5.32	9.25

* Power fixed charge pro-rated on a demand basis.

Rank of States as Users of Electrical Energy

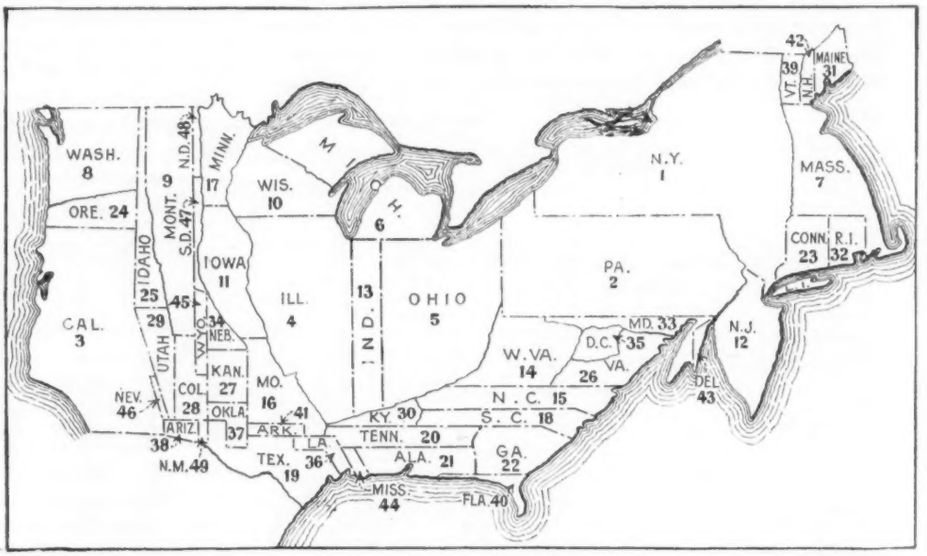


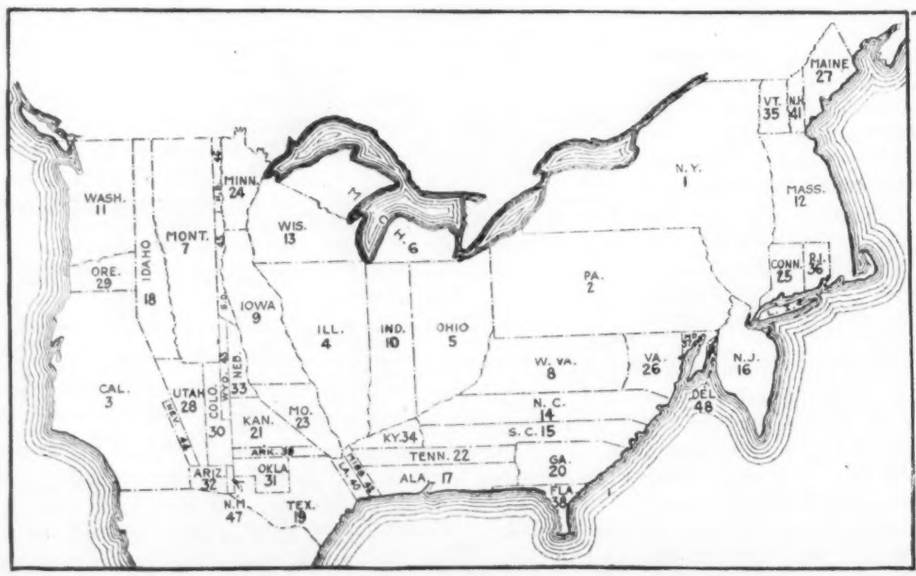
Relative Size of States Based on Electrical Energy Sold to Power Customers

Rank	State	Kilowatt-Hours	Per Cent of Total
1	New York	3,475,000,000	15.30
2	Pennsylvania	2,905,000,000	13.20
3	California	2,095,000,000	9.50
4	Illinois	1,590,000,000	7.30
5	Michigan	1,470,000,000	6.76
6	Massachusetts	978,000,000	4.43
7	Montana	898,000,000	4.07
8	Ohio	720,000,000	3.36
9	Minnesota	568,000,000	2.59
10	Washington	509,000,000	2.31

Relative Size of States Based on Electrical Energy Sold for Light and Power

Rank	State	Kilowatt-Hours	Per Cent of Total
1	New York	5,707,000,000	14.70
2	Pennsylvania	3,681,000,000	9.46
3	California	3,449,000,000	8.85
4	Illinois	2,860,000,000	7.38
5	Ohio	2,785,000,000	7.16
6	Michigan	2,040,000,000	5.20
7	Massachusetts	1,216,000,000	3.12
8	Washington	1,180,000,000	3.03
9	Montana	1,133,000,000	2.90
10	Wisconsin	965,000,000	2.50





Relative Size of States Based on Electrical Energy Sold for Light and Power, but Excluding Energy Consumed in Cities with Population Over 100,000

Rank	State	Kilowatt-Hours	Per Cent of Total
1	New York	3,439,100,000	13.45
2	Pennsylvania	2,498,000,000	9.79
3	California	2,215,200,000	8.65
4	Illinois	1,365,000,000	5.35
5	Ohio	1,257,000,000	4.93
6	Michigan	1,213,000,000	4.75
7	Montana	1,133,000,000	4.44
8	West Virginia	940,000,000	3.69
9	Iowa	838,000,000	3.28
10	Indiana	744,500,000	2.93

Electrical Importance of the Various States

Map Indicates that Almost 80 per Cent of the Electric Light and Power Industrial Field Lies East of the Rocky Mountains—New York and Pennsylvania Lead in Amount of Electrical Energy Consumed

MAPS indicating the relative importance of the various states as users of electrical energy are shown on the opposite page. Actually only 60.7 per cent of the area of the United States is east of the Rocky Mountains, but if the areas of the various states were based on the percentage of the total electrical energy sold to power customers, then 79.2 per cent of the total area of the country would be east of the Rockies. A study of the 1920 population indicates that 91.7 per cent of the American people live in states east of the Rocky Mountains. These maps would indicate that at the present time almost 80 per cent of the market for electrical manufacturers lies in the Central and Eastern States. The importance of the western section, however, is rapidly increasing, the present rank of the Pacific States being third and the Mountain States ranking fourth; but there seems to be little doubt that the big field of electrical activity will remain in the eastern portion of the United States for some time to come.

RELATIVE IMPORTANCE OF THE STATES OF THE UNION FROM THE VIEWPOINT OF THE ELECTRICAL INDUSTRY

States	Kw.-Hrs. Sold to Power Customers (1919)			Total Kw.-Hrs. Sold for Light and Power (1919)			Kw.-Hrs. Sold for Light and Power Excluding Cities of Over 100,000 Population (1919)			Population of States (1920)		
	Rank	Kilowatt-Hours	Per Cent of Total	Rank	Kilowatt-Hours	Per Cent of Total	Rank	Kilowatt-Hours	Per Cent of Total	Rank	Population	Per Cent of Total
United States	..	22,046,900,000	....	..	38,875,000,000	....	..	25,510,000,000	....	..	105,709,771	....
New England:												
Maine	26	193,700,000	0.88	31	232,000,000	0.60	27	232,000,000	0.92	35	768,014	0.73
New Hampshire	37	94,800,000	0.44	42	68,500,000	0.18	41	68,500,000	0.27	41	443,083	0.42
Vermont	32	148,200,000	0.67	39	142,700,000	0.37	35	142,700,000	0.56	45	352,428	0.33
Massachusetts	6	978,000,000	4.43	7	1,216,000,000	3.12	12	713,900,000	2.80	6	3,852,356	3.64
Rhode Island	31	161,000,000	0.73	32	230,000,000	0.59	36	137,500,000	0.54	38	605,397	0.57
Connecticut	19	280,300,000	1.27	23	470,000,000	1.22	25	277,300,000	1.08	29	1,380,631	1.31
Middle Atlantic:												
New York	1	3,475,000,000	15.30	1	5,707,000,000	14.70	1	3,439,100,000	13.45	1	10,384,829	9.81
New Jersey	15	360,000,000	1.63	12	900,000,000	2.32	16	553,250,000	2.17	10	3,155,900	2.98
Pennsylvania	2	2,905,000,000	13.20	2	3,681,000,000	9.46	2	2,498,000,000	9.79	2	8,720,017	8.25
South Atlantic:												
Delaware	43	38,000,000	0.17	43	61,700,000	0.16	48	8,800,000	0.04	47	223,003	0.21
Maryland	11	418,000,000	1.90	33	227,500,000	0.59	37	114,000,000	0.45	28	1,449,661	1.37
Dist. of Columbia	42	32,500,000	0.15	35	216,000,000	0.55	49	....	0.00	42	437,571	0.41
Virginia	25	205,700,000	0.93	26	420,000,000	1.08	26	272,500,000	1.07	20	2,309,187	2.18
West Virginia	22	242,000,000	1.10	14	940,000,000	2.05	8	940,000,000	3.69	27	1,463,701	1.39
North Carolina	23	235,000,000	1.07	15	665,000,000	1.72	14	665,000,000	2.60	14	2,559,123	2.42
South Carolina	29	174,000,000	0.79	18	590,000,000	1.52	15	590,000,000	2.32	26	1,683,724	1.59
Georgia	24	206,900,000	0.94	22	510,000,000	1.32	20	374,700,000	1.46	12	2,895,832	2.74
Florida	39	70,800,000	0.32	40	110,900,000	0.29	38	110,900,000	0.44	32	968,470	0.92
East North Central:												
Ohio	8	720,000,000	3.36	5	2,785,000,000	7.16	4	1,257,900,000	4.93	4	5,759,394	5.45
Indiana	18	311,300,000	1.51	13	880,000,000	7.26	10	744,500,000	2.93	11	2,930,390	2.77
Illinois	4	1,590,000,000	7.30	4	2,860,000,000	7.38	5	1,365,000,000	5.35	3	6,485,280	6.14
Michigan	5	1,470,000,000	6.76	6	2,040,000,000	5.20	6	1,213,000,000	4.75	7	3,668,412	3.47
Wisconsin	14	388,500,000	1.86	10	965,000,000	2.50	13	694,000,000	2.73	13	2,632,067	2.49
West North Central:												
Minnesota	9	568,000,000	2.59	17	609,000,000	1.60	24	280,700,000	1.10	17	2,387,125	2.29
Iowa	21	256,100,000	1.16	11	933,000,000	2.40	9	838,500,000	3.28	16	2,404,021	2.27
Missouri	12	397,400,000	1.80	16	639,000,000	1.64	23	286,400,000	1.13	9	3,404,055	3.22
North Dakota	49	6,900,000	0.03	48	29,600,000	0.08	46	29,600,000	0.12	36	645,680	0.61
South Dakota	47	12,800,000	0.06	47	44,500,000	0.11	45	44,500,000	0.18	37	636,547	0.60
Nebraska	34	117,800,000	0.53	34	222,000,000	0.57	33	150,500,000	0.59	31	1,296,372	1.23
Kansas	28	174,500,000	0.79	27	385,000,000	0.99	21	314,900,000	1.23	24	1,769,257	1.67
East South Central:												
Kentucky	35	103,100,000	0.47	30	252,000,000	0.69	34	145,100,000	0.57	15	2,416,630	2.28
Tennessee	30	173,200,000	0.79	20	550,000,000	1.40	22	289,500,000	1.14	19	2,337,885	2.21
Alabama	16	356,200,000	1.61	21	531,000,000	1.38	17	477,500,000	1.88	18	2,348,174	2.22
Mississippi	45	21,500,000	0.10	44	59,300,000	0.15	42	59,300,000	0.23	23	1,790,618	1.69
West South Central:												
Arkansas	44	23,400,000	0.11	41	103,000,000	0.28	39	103,000,000	0.41	25	1,752,204	1.66
Louisiana	41	53,600,000	0.24	36	192,500,000	0.49	40	71,100,000	0.28	22	1,798,509	1.70
Oklahoma	36	96,000,000	0.44	37	179,000,000	0.46	31	179,000,000	0.70	21	2,028,283	1.92
Texas	13	391,000,000	1.77	19	592,000,000	1.50	19	417,350,000	1.64	5	4,663,228	4.42
Mountain:												
Montana	7	898,000,000	4.07	9	1,133,000,000	2.90	7	1,133,000,000	4.44	39	548,889	0.52
Idaho	20	258,600,000	1.17	25	426,000,000	1.10	18	426,000,000	1.68	43	431,866	0.41
Wyoming	46	15,700,000	0.07	45	53,300,000	0.14	43	53,300,000	0.21	48	194,402	0.18
Colorado	27	188,600,000	0.86	28	381,000,000	0.98	30	200,300,000	0.79	33	939,629	0.89
New Mexico	48	7,600,000	0.03	49	15,800,000	0.04	47	15,800,000	0.06	44	360,350	0.34
Arizona	38	90,000,000	0.41	38	160,000,000	0.41	32	160,000,000	0.63	46	333,903	0.32
Utah	17	355,000,000	1.61	29	342,000,000	0.88	28	221,000,000	0.87	40	449,396	0.43
Nevada	40	59,400,000	0.27	46	45,700,000	0.12	44	45,700,000	0.18	49	77,407	0.07
Pacific:												
Washington	10	509,000,000	2.31	8	1,180,000,000	3.03	11	729,600,000	2.85	30	1,356,621	1.28
Oregon	33	118,800,000	0.54	24	450,000,000	1.16	29	210,600,000	0.82	34	783,389	0.74
California	3	2,095,000,000	9.50	3	3,449,000,000	8.85	3	2,215,200,000	8.65	8	3,426,861	3.24
Sections												
New England	5	1,856,000,000	8.4	7	2,359,200,000	6.1	7	1,571,900,000	6.2	7	7,401,909	7.0
Middle Atlantic	1	6,740,000,000	30.5	1	10,288,000,000	26.5	1	6,490,350,000	25.5	1	22,260,746	21.0
South Atlantic	6	1,622,900,000	7.3	4	3,741,100,000	9.6	4	3,075,900,000	12.1	3	13,990,272	13.2
East North Central	2	4,479,800,000	20.5	2	9,530,000,000	24.5	2	5,274,400,000	20.5	2	21,475,543	20.5
West North Central	7	1,533,500,000	7.0	5	2,862,100,000	7.4	6	1,945,100,000	7.7	4	12,543,057	11.9
East South Central	8	654,000,000	3.0	8	1,392,300,000	3.6	8	971,400,000	3.8	6	8,893,307	8.4
West South Central	9	564,000,000	2.5	9	1,066,500,000	2.7	9	770,450,000	3.0	5	10,242,224	9.7
Mountain	4	1,872,900,000	8.5	6	2,556,800,000	6.6	5	2,255,100,000	8.8	9	3,335,842	3.1
Pacific	3	2,722,800,000	12.3	3	5,079,000,000	13.0	3	3,155,400,000	12.4	8	5,566,871	5.2

Readers' Views and Comments

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Resuscitation from Electrical Shock by the Prone-Pressure Method

To the Editor of the ELECTRICAL WORLD:

SIR: Confidence in the Schafer or "prone-pressure" method of resuscitation and objection to alleged mechanical means or any modification of the published and authoritative prone-pressure method have been established, first, by the personnel, research, deliberation and report of the third resuscitation commission representing the American Medical Association, the National Electric Light Association and the American Institute of Electrical Engineers, with which commission the accident prevention committee of the National Electric Light Association was in conference and accord, and, second, by the experiences of the companies constituting the membership of the National Electric Light Association with successful cases of resuscitation from electric shock by the prone-pressure method, both before and subsequent to the report of the commission. These two reasons for confidence are obviously of such reputable and representative character that no one, and particularly no public utility, would be justified in modifying the commission's conclusions or violating the text of its instructions. Such departure from the text, if justifiable, should only be presumed or encouraged after some commission of like personnel, reputation and acknowledged ability has again officially passed upon the subject and recorded its recommendations for changes in the rules now in force. These statements would seem to make it unnecessary to present a detailed argument against the modification of the approved method.

During the study and research of the commission evidence was produced that a considerable number of successful cases of resuscitation from electric shock were reported where the injured man fell from a pole or structure. A representative advocating mechanical means of resuscitation proposed as a supplement to the treatment afforded by his device traumatic shock, either by giving the body a jolt or by tapping the foot or other parts of the body. The National Electric Light Association committee incorporated this feature of traumatic shock as an auxiliary or detail of the prone-pressure method, believing that in certain cases it might be helpful toward restoration, but it should be remembered that this feature is incorporated as one of the details of the entire recommended treatment. Whatever theories or scientific deductions may have prompted the committee in arriving at its conclusions and recommendations, the electrical industry must certainly be convinced that the practice of the published rules is indispensable as a part of the operation of electric properties.

It would be interesting to know how many lives have been saved by the prompt and proper application of the method since the committee met in May, 1918. Such failures to resuscitate as have been reported are comparatively few and mostly due to one of two causes: (a) Failure to apply the method promptly, (b) failure to apply the method properly. Circumstances and conditions may make the necessary promptness impossible, but improper application is nearly always inexcusable.

Until some properly constituted and reputable body of experts shall decide upon a better method, electric power and light companies should carefully train all employees to administer the method in strict accordance with the published text.

CHARLES B. SCOTT,
Chairman Accident Prevention Committee, N. E. L. A.
Manager Bureau of Safety,
Director National Safety Council.
Middle West Utilities Company, Chicago.

Unsymmetrical Illumination

To the Editor of the ELECTRICAL WORLD:

SIR: In any working space using general illumination the light is commonly well distributed with reference to objects seen so that the two eyes divide the work with reasonable fairness, one being in about the same circumstances as regards direction and intensity as the other. Unless one can preserve this reasonable symmetry in illumination of all kinds serious trouble may follow, particularly if the eyes are normally under any slight strain. This I have recently experienced several times to my sorrow. For example, it is quite possible so to arrange a reading lamp that a book held in the hand will be fairly well illuminated as regards one eye and rather badly as regards the other. Similarly a condition may be reached where there is some specular reflection of a unilateral sort. The effect of such inequality in lighting makes itself manifest in various ways. The two eyes may be forced to work at somewhat different apertures, introducing a slight difference in refraction. For this reason, or in an attempt at equalizing things, one eye may be under a muscular strain of accommodation or position which will quickly make itself felt. In cases of astigmatism the difference in condition as respects eyes may be very much aggravated and a considerable amount of strain appear very promptly. It is, I think, mostly in the attempt of the eyes to equalize errors of refraction under differing illuminations that trouble most easily arises. It appears as simple eye strain, with the ordinary symptoms of more or less pain and a feeling of sand in the eyes, lasting for some hours if the conditions which have been experienced have been bad.

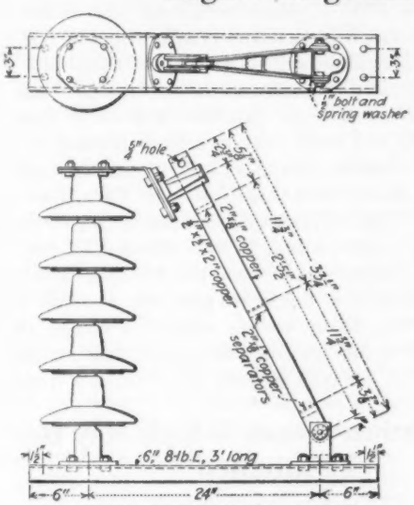
Exactly the same thing can happen in the case of natural lighting where there is sufficient light on one side and a considerably reduced amount on the other. I have observed these effects of lack of uniformity in illumination in myself and in others a good many times and am convinced it is a condition which should be guarded against more carefully than has usually been the case. To get thoroughly good lighting, especially for continued or critical work, the illumination should have the same effective value seen by either eye and should have equal freedom from specular reflection considering both. This condition implies both fair uniformity in lighting and symmetry of position in using the eyes. This condition is particularly worth attaining in schools and clerical offices where many people are engaged in somewhat steady visual work, generally without any proper inspection for the errors of refraction which lie at the root of eye strain.

LOUIS BELL,
Boston, Mass. Consulting Engineer.

Station and Operating Practice

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

Simplified Grounding Switch for Outdoor High-Voltage Lines



UNIT-TYPE GROUNDING SWITCH SIMPLIFIES CONSTRUCTION

FOR grounding 60,000-volt lines on outdoor racks the Southern California Edison Company has developed the simplified unit-type switch illustrated. By placing the switch at an angle its operation by means of a stick held by the operator standing on the ground below has been made easy. At the same time all necessary clearances have been cared for. The insulating unit consists of a five-section rigid pillar insulator which is attached to a 3-ft. piece of 6-in., 8-lb. channel iron. The ground wire is attached to the channel iron.

Southern California Edison Co. W. R. BATTEY,
Los Angeles, Cal. Chief Electrical Designer.

Companies Want Standardization of Instrument Transformers

STANDARDIZATION of a number of features of instrument transformers was advocated at the Miami convention of the Southeastern Section of the N. E. L. A. The discussion was the result of a questionnaire sent to member companies by the meter committee of the section. The committee's report contained answers of the companies as well as the committee's recommendations.

In this report standardization of the manner of bringing out leads of current transformers was strongly advised as regards both their polarity and their position. A unanimous opinion favored bringing out the leads at the sides of the transformer instead of the ends to give greater safety for handling the leads while the transformer is energized and to permit neater wiring. All companies were in favor of having the nameplate in front of the transformer so that it may be read when the transformer is in position. Nine companies preferred that the transformer feet should be fitted for mounting on pipe framework as well as on brackets or walls, while six were satisfied with wall mounting.

For potential transformers also it was urged that the polarity of leads be standardized. The polarity should be the same on corresponding primary and secondary leads. Moreover, it was pointed out that the use of paint for marking polarity should be discontinued, because leads are frequently repainted, thus covering all painted markings. Brass tags were suggested for use in place of paint. The committee urged that the leads of potential transformers be constructed so that oil will not siphon out of the cases of oil-insulated transformers. Several companies reported such trouble, which they overcame by cutting off an inch of insulation inside the case and soldering together the strands where this insulation was removed. The proper position for nameplates was unanimously declared to be on the side of the transformer opposite to the mounting. For 2,200-volt installations it was agreed that oil insulation was not desirable in potential transformers.

Although there was some diversity of opinion, the majority ruled that there should be no fuses on potential transformers in customers' substations, but that such transformers should have fuses in a station where a company operator is in attendance.

Alabama Power Company, S. A. FLETCHER,
Birmingham, Ala. Superintendent of Service.

Hauling Heavy Penstock Sections up Mountain Roads

ONE method of hauling heavy equipment to the site of the Kerckhoff project of the San Joaquin Light & Power Corporation, described in the ELECTRICAL WORLD for Feb. 26, page 471, is illustrated in the accompanying photograph. This shows a 5-ton Mack truck and a two-wheel 5-ton dolly hauling a section of the penstock line. This pipe weighs about 7 tons, is 22 ft. long and 8 ft. in diameter. The haul was over mountain roads for

THREE 5-TON TRUCKS AND TRAILERS TRANSPORTED THE PENSTOCK PARTS TO THE KERCKHOFF POWERHOUSE

5 miles with many turns and a maximum grade of 12 per cent.

The total weight of penstock, including gates, was 1,500,000 lb., or 750 tons, made up by 138 pieces of pipe varying in weight from 4,000 lb. to 14,800 lb., three complete gates, and miscellaneous fittings, bolts, rivets, etc. All the penstock was hauled with three 5-ton Mack trucks, each equipped with a 5-ton two-wheel trailer. Both the trucks and trailers were equipped with specially designed oscillating bolsters to permit the long wheel base to be hauled over the short curves in the road. Each truck made three round trips daily, delivering the entire penstock in 118 trips, an average of 6.4 tons per load.

R. C. STARR,
Construction Engineer.

San Joaquin Light & Power Corporation,
Fresno, Cal.

Analyzing Records of CO_2 and Combustible Gases

AN ANALYSIS of the accompanying chart shows that continuous records of combustible gases present in the flue should be kept as well as CO_2 records. In this chart the clear space from the bottom upward represents the percentage of CO_2. The lightly shaded area between the white space and the heavily shaded area represents the percentage of combustible gases. The chart was taken on a duplex gas-analyzing instrument.

A consultation of the chart shows that combustible gases started to form in one case when CO_2 is at 10 per cent and in another case when CO_2 reached 8½ per cent. In the first case, at the point *B*, to the left, combustible gases began to form when the percentage of CO_2 was 10. The amount of combustible gases increased rapidly as the percentage of CO_2 increased to 11, only to vanish again when the percentage of CO_2 was again reduced to 10. At point *C*, to the right, combustible gases began to form again, this time, however, when CO_2 was only 8½ per cent. This shows that between 4:30 in the morning and 3 o'clock in the afternoon changes took place in the furnace conditions such that while combustible gases began to form early in the morning when CO_2 was 10 per cent, they began to form in the afternoon when CO_2 was only 8½ per cent. Should the operator keep CO_2 at 10 per cent all day long, it is evident that serious losses might take place, as in this case between 3 and 4 o'clock in the afternoon, as indicated in the right-hand part of the diagram. That is what happens when the maximum allowable CO_2 is determined for an indefinite period by a snap CO test. Therefore it is clear that constant records such as those shown are valuable for continually securing the most effective combustion conditions.

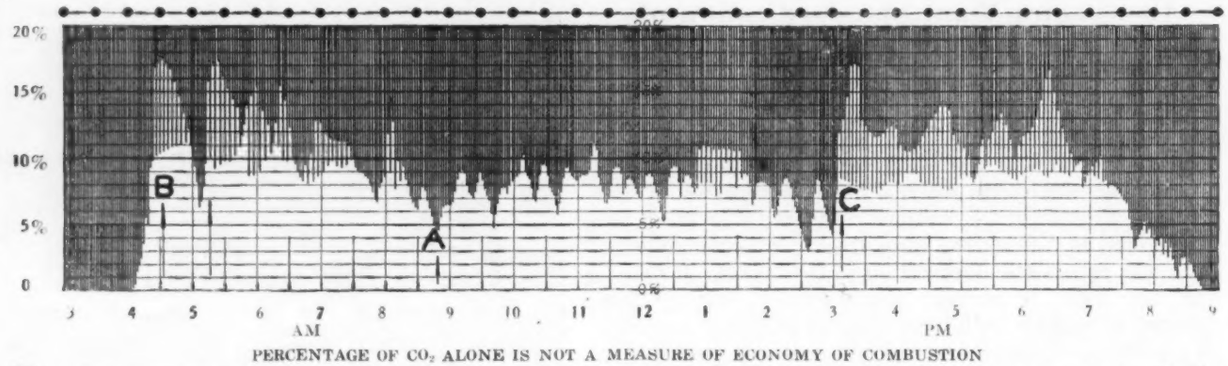
A brief description of the operation of the instrument used, which is made by the Mono Corporation of America, may be of interest. The apparatus is driven by water pressure of about 10 lb. per square inch. Before entering the instrument the gas samples from the flue are pulled through a filtering system, which removes soot and dirt. They are then forced through the apparatus by a mercury piston. There are no mechanical valves. Samples of gas are forced alternately through two routes—one leading directly through a caustic potash tank where CO_2 is absorbed, and the other first through an electrically heated furnace wherein the combustion gases are oxidized to CO_2 and H_2O, and then through the caustic potash tank. Samples that are forced through the caustic potash tank only give the readings for CO_2. Those that are first forced through the electrically heated furnace and then through the caustic potash tank give readings of CO_2 plus combustible gases. The difference between any two successive readings is proportional to the amount of the combustible gases present at the time the analyses are made. These instruments are made to produce records covering a range of 20, 25 or 40 per cent. A range shifter can be provided to adjust the position of the range.

New York, N. Y. FIELD EDITOR ELECTRICAL WORLD.

Distribution Losses Which May Be Eliminated

IN DISTRIBUTING electrical energy there are some losses, such as copper, transformer and conversion losses, that cannot be entirely eliminated; still, there are a great many other losses that may be overcome. It is possible to determine what losses may be reduced by a careful survey of the entire system, after which the problem may be considered as being divided into five parts, as follows: (1) To determine how much of the loss is necessary and how much is avoidable; (2) to locate and correct the cause of the avoidable losses and guard against their recurrence; (3) to furnish information whereby legitimate losses may be reduced by changes in operating practice and physical condition; (4) to furnish the rate department with information which will allow correct schedules to be applied and to see that billing departments receive necessary data for correct billing; (5) to furnish statistical information for use in constructing more equitable rates.

Although it is possible to reduce the amount of legitimate losses on a distribution system, there is a point beyond which it is unprofitable to go because the



PERCENTAGE OF CO_2 ALONE IS NOT A MEASURE OF ECONOMY OF COMBUSTION

White area represents per cent of CO_2. Lightly shaded area shows amount of combustible gases. Combustible gases start at B with 10 per cent of CO_2, but at C they start with 8½ per cent of CO_2.

small saving possible will be overbalanced by the expense. The losses that cannot be entirely eliminated but can be improved are as follows: Distribution copper losses, transformer core losses, conversion losses and meter shunt losses. Distribution copper losses can be reduced to a minimum by installing copper wire of sufficient size to carry the current transmitted. There is a point, however, in the size of copper where it is unprofitable to increase the size. Transformer copper losses are practically set, depending upon the load carried on each transformer. With a twenty-four-hour load curve on the operation of a transformer it is possible to estimate this loss. Transformer core losses can be improved considerably by installing a transformer of sufficient size to replace several smaller ones. The core loss per kva. decreases quite rapidly with the increased size of the transformer. It also depends upon the type of iron used in the core. The iron of today is better than that of some years ago (see table). Conversion losses where a light load is carried on a large unit may be reduced considerably by using a smaller unit. Meter shunt losses are constant and can be estimated if the sizes, types and makes of the meters are known.

A few of the avoidable losses that should be reduced are: Stolen energy, low voltage, removal of primary fuse of potential transformer by customer, overloaded instrument transformers, crossing of secondary wires, lack of control on flat-wire circuits, inaccurate meters, contact of primary wires with trees, and lack of proper maintenance.

As for the inaccuracy of watt-hour meters, it is generally agreed that the frequency of such tests will depend largely upon the revenue derived from the particular meter. In some states legislation is in effect

TRANSFORMER CORE LOSSES FOR DIFFERENT SIZES AND DATES OF MANUFACTURE

Kva. Rating	Loss in Watts — Made in 1894 to 1909 Iron	Made in 1894 to 1909 Copper	Made in 1909 to 1920 Iron	Made in 1909 to 1920 Copper
0.6	23	15	...	...
1	30	28	20	25
1.5	35	35	25	35
2	43	43	29	44
2.5	50	46	32	53
3	53	55	34	63
4	61	77	37	70
5	67	90	42	82
7.5	98	125	58	110
10	115	156	69	140
15	155	220	95	190
20	190	275	120	225
25	210	350	130	310
30	230	400	150	365
37.5	305	420	175	405
40	325	480	190	415
50	375	640	230	510
75	415	850	500	825
100	...	...	530	1,050
150	...	...	725	2,000
200	...	...	950	2,350

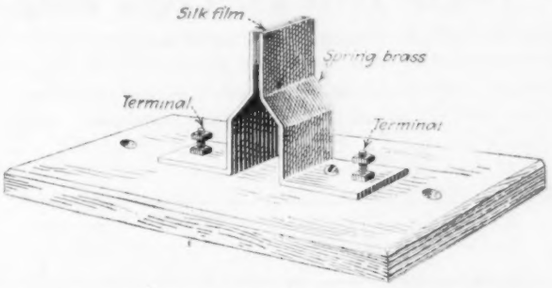
which specifically states the period of tests. In any event a test schedule should be developed taking into account the revenue earned and the revolutions of the meter, rather than merely the size of the meter. Direct-current meters usually require more frequent testing than alternating-current meters. For instance, with a certain type of meter one company tests every thirty-six months if the monthly revenue is not more than $5. The frequency is increased until for a revenue of $500 or more the period is only three months

THEO. H. RICE,
Operating Department.

Henry L. Doherty & Company,
New York, N. Y.

Silk-Film Device Prevents Damage to Opened Current Transformer

IN ORDER to prevent a dangerous rise in potential across the secondary terminals of a current transformer when the meter or relay circuit is accidentally opened, the writer has developed a protective device, as shown in the drawing, consisting of two brass spring contacts held apart by a silk film similar to those used in the sockets of series incandescent lamps. Each of



SILK FILM CONNECTED ACROSS SECONDARY OF CURRENT TRANSFORMERS WILL PREVENT HIGH VOLTAGES BEING INDUCED

these two contacts is connected to the terminals of the secondary of the current transformer as close to the transformer as possible. When an open circuit occurs the voltage punctures the silk film and no abnormal stress is put on the insulation of the transformer. Silk films one layer thick will puncture at a potential of about 200 volts.

It is well known that opening the secondary of a current transformer carrying load is likely to result in damaging the insulation and even in injury to an operator who may come in contact with the circuit. Short-circuiting the transformer by means of the contacts described, will prevent a dangerous potential from being induced and will not, of course, damage the transformer.

R. H. N. LOCKYER,
Engineer in Charge.

West Kootenay Power & Light Company,
Trail, B. C.

Value of Treating Cross-Arms Is Questioned

PRESERVATIVE treatment of cross-arms is a subject which at a recent meeting of the Empire State Gas and Electric Association brought forth a lively discussion as to the policies of the various companies in the use of painted, hot-dipped and untreated cross-arms. It was pointed out that painting is not entirely satisfactory because the pinholes cannot be adequately filled, and that moisture drawn in through the end fibers is held within the arm by the outer preservative treatment and rot results. Many companies are using untreated close-grained fir arms, which are said to have a life of fifteen years. Although it is claimed that a preservative will make even a good arm last longer, it is a question whether it is worth while to try to obtain a cross-arm that will have a longer life than the pole upon which it is mounted. Some companies that have used treated arms state that their linemen object to handling treated poles and that considerable trouble has been occasioned during the hot weather by dripping of the preservative.

FIELD EDITOR ELECTRICAL WORLD.

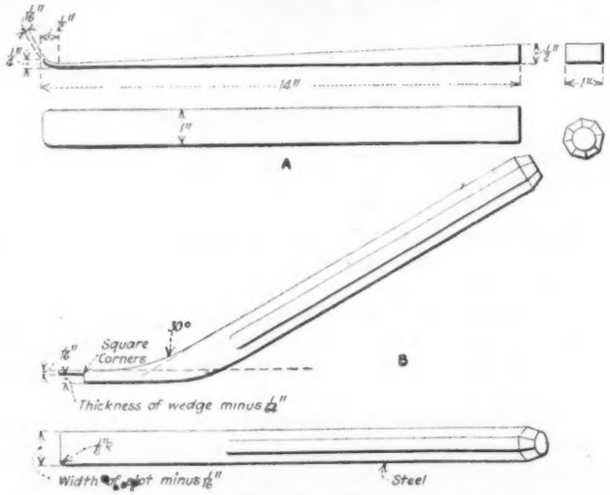
New York, N. Y.

Industrial Applications

The Economical Utilization of Electrical Energy in Mills and Factories, Together with Practical Details of Installation, Control, Testing and Repair of Equipment Required

Tool for Driving Out Tight Wedges

IN ORDER to remove very tight wedges from a large generator it was necessary for a certain repair shop to construct a specially shaped tool which differs from those usually used for removing wedges. This tool,



TOOLS FOR DRIVING WEDGES OUT OF SLOTS

A—Special tool for breaking up wedges which cannot be driven out. B—Tool useful for driving wedges in or out of slots.

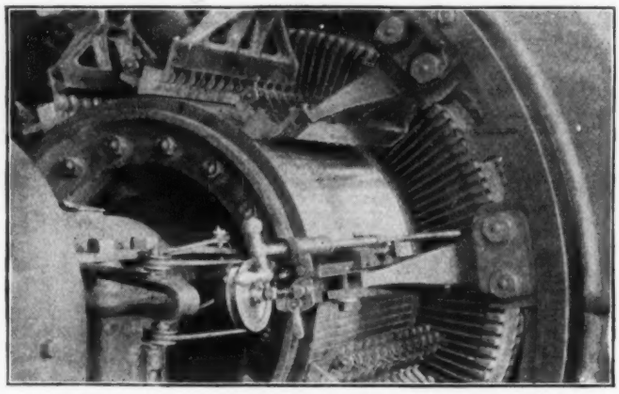
which is shown in drawing A, consists of a long tapered wedge with the front end bent over slightly and polished, and this end was used for prying the wedge out of the slot instead of driving it out lengthwise. The coils were in excellent condition and were to be saved and consequently it was necessary to be careful in removing the wedges. When an attempt was made to drive the wedges in the ordinary manner they refused to move. They were of composition material, nine wedges per slot, and the stator iron was 5 ft. 5 in. long with a bore of 24 in.—the small space to work in making the job still more difficult. All of the available wedge-driving tools were tried without success. It was noticed, however, that in using a chisel to make a hold for the wedge-driving tool shown at B, the wedge material pulled apart easily, flaking like mica. Accordingly a few wedges were removed by cutting one side near the iron with a diamond chisel, but this was very slow work. Therefore, it was decided to make another tool which would take advantage of the easy splitting quality of the wedge material. A piece of steel was purchased 1 in. wide (the slot being 1¼ in.), 14 in. long and ½ in. thick. This was forged to the shape shown in Fig. A, making a long tapered wedge. The front end was bent over slightly as shown, and the tool was well polished on a buffing wheel for a distance of about 5 in. from this end. The tool was then driven in between the top of the coil and the bottom of the wedge with a rawhide mallet. This solved the problem satisfactorily, as the slot wedge was forced out of the groove by tearing the material apart and no damage was done to the coils or slots. The only precaution required was that in starting the tool it had to be tapped lightly while bearing down on the outer end. The wedges were removed by two men in four hours, which was a much quicker job than is usually done in driving them out, there being 324 wedges 7¼ in. long, 1⅛ in. wide and 3/32 in. thick.

It will be found that in most cases a tool shaped like the one shown in B is usually very effective in driving out wedges. This tool may also be put to very good use in driving wide wedges into the slots. A. C. ROE.

Detroit, Mich.

Tool Rest for Turning Commutators

FOR turning down commutators of 500-kw., 125-volt direct-current machines the mechanical department of a large electrolytic plant in Canada has made a very successful self-feeding tool holder. With this holder commutators 2 ft. 6 in. in diameter and 1 ft. 7 in. long are turned down in the average time of two hours. This machine consists practically of a modified compound slide rest. To apply the machine it is necessary only to move the brush boxes from one brush and clamp on the slide rest. The brush is driven through gears by means of a small pulley which has a worm gear upon its shaft. A round leather belt drives this small pulley. This belt itself is driven by the shaft of the machine which is being turned down, the belt passing over four idler pulleys before it gets to the small driving pulley. The



TOOL FOR TURNING DOWN COMMUTATOR DRIVEN FROM SHAFT OF MOTOR

pulley can be made to run free, or, in other words, stop the feed by means of a jam nut on the pulley end of the worm shaft. The feed may be reversed by means of a gear shift, so that when the cutter has gone across the face of the commutator it may be readjusted for a deeper cut and brought back across the commutator.

In turning a commutator a diamond-point tool should be used. This tool should be rounded sufficiently for

the cuts to overlap and not to cut a thread on the commutator surface. For the same reason it is necessary to use a very fine feed. Usually a surface speed of 500 ft. to 600 ft. per minute should not be exceeded. Some scheme must always be devised for taking up the end play of the shaft while the commutator is being turned. The machine has proved very satisfactory. Although sandpaper may be used with success for resurfacing a commutator which is dirty or one in which the mica is just beginning to get high, and although stoning will remove considerable high mica and even small flat spots, when the condition of the commutator is at all bad turning with a tool as described is the only satisfactory remedy.

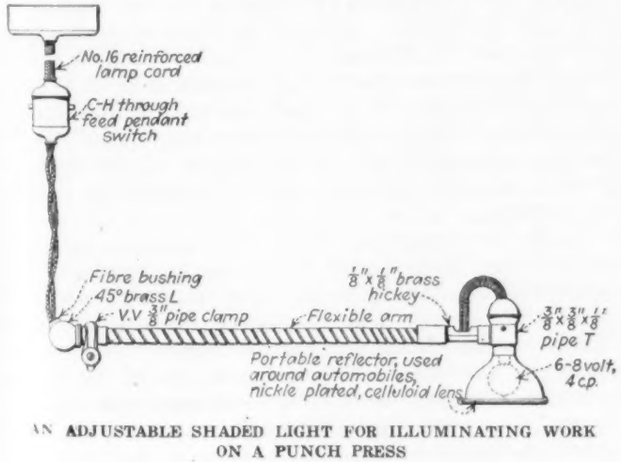
R. H. N. LOCKYER.

Trail, B. C., Canada.

Practical Bracket and Lamp for Punch Presses

MANY manufacturers who use presses know the need of a practical and efficient form of illumination. A lamp bracket for the individual illumination of each punch press which is not only economical to operate but also very effective is illustrated herewith. Those who operate open-back inclinable punch presses usually hang an electric light bulb behind the die in the open back; others hang ordinary drop lights over the operator, and some resort to general illumination. None of these methods is entirely satisfactory.

The bracket shown is clamped on either side of the punch press, and the light is focused on the die. A 4-cp., 6-volt double-contact automobile bulb is used, which is very rugged and gives a white light of ample intensity. The brackets have been assembled from standard parts, such as a flexible gooseneck, brass hickey, ⅛-in. x ⅜-in. x ⅜-in. iron-pipe T and a small reflector made for use as a portable light around automobiles. The reflector is 2½ in. in diameter and entirely shades the bulb, eliminating all glare from the operator. The actual cost of the entire assembly was less than $2.50, including labor and all parts. The current used is alternating at 6 volts,



AN ADJUSTABLE SHADED LIGHT FOR ILLUMINATING WORK ON A PUNCH PRESS

obtained from a 110-volt line through toy transformers which feed six or more lights.

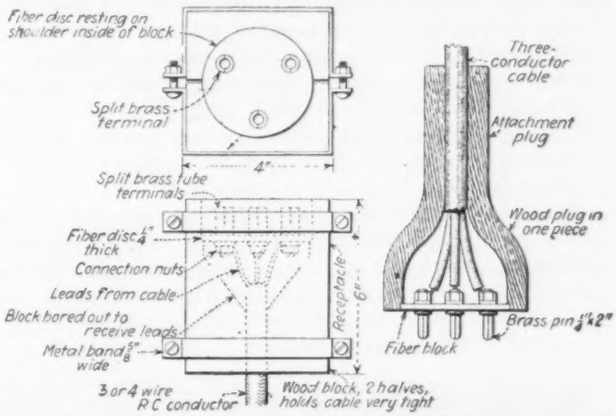
Several hundred of the brackets have been installed in the punch press rooms of a large corporation manufacturing adding machines, tin cans and other articles and have given excellent results.

American Can Company, Chicago, Ill.

JOHN A. TOLEIK, Electrical Engineer.

Rugged Attachment Plug for Portable Shop Machine

AN ATTACHMENT plug made by the writer for connecting an electrically driven sand cutter should be useful in many other shops where electrical machines are used which are wheeled around from one location to another. This plug is attached to an overhead beam, and in order that the cable shall not be in the way on the floor of the foundry the slack is wound on a reel mounted upon the cutter. The service is run to the center of the room along the beam in conduit. At the



THE RECEPTACLE IS HUNG ON OVERHEAD BEAM FOR FEEDING PORTABLE MACHINES

end of this conduit the copper wire is spliced to a heavy flexible cable, two-wire, three-wire or four-wire, depending upon the type of motor. This cable is hung down to a height which can be reached from a short stepladder, and a receptacle is attached to its lower end. The author has made a receptacle out of wood blocks with three brass tubes inserted in them for a three-phase line. Into this receptacle fits a wooden plug, into which in turn are fitted three brass pins. These brass pins fit in the brass tubes in the receptacle. To the plug is attached the cable which runs to the machine. About 4 ft. from the plug the cable is fastened in a split-wood clamp having an iron plate upon one of its faces which is drilled to take a hook. This hook is fastened to a chain which is passed over the beam and bolted together so that all strain is taken off of the plug and the cable is supported by the chain.

The cable used for such work should have stranded copper conductors covered with enough rubber to prevent short circuit, well reinforced with strong strain cords and with a closely woven outer braid. Although it is known that one conductor in such a cable is open, it is often very difficult to locate the exact position of the break. This may be accomplished by connecting a lamp across the switch at the machine end of the cable and twisting and bending the cable from one end to the other until the lamp lights on account of bringing the broken ends together.

In repairing such a cable where only one conductor is broken, it is best to try to discover this conductor and repair it without cutting the other conductors. This may be done by baring one broken end for six or seven inches and splicing on a piece of similar wire and then splicing it on the other end of the broken conductor. No solder should be used, as it stiffens the joints and causes them to break more readily. After splicing rubber and friction tapes are applied and the cable is built

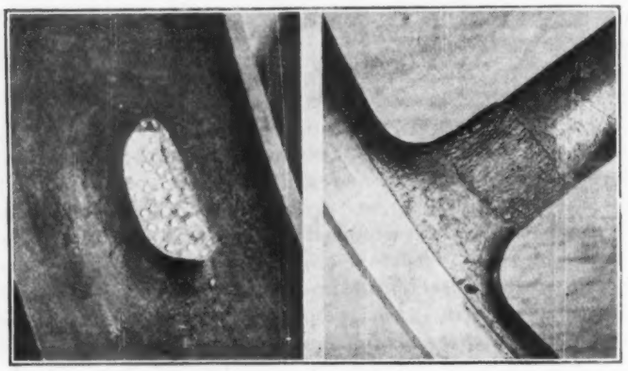
up to a uniform diameter. If more than one conductor is to be spliced, the joints should be staggered. When cutting into the braid with a knife, care should be taken not to make too deep a cut and thus spoil the insulation on the good conductors. H. S. Rich.

East Berlin, Conn.

Studding Cast-Iron Welds Relieves Contraction Strains

Admitting that steel can be welded to cast iron where the parts are free to align themselves, the use of studding is advantageous where the weld is in such a position that the parts are not free to align themselves with the contraction cooling strains that result. In such a case a steel weld made to cast iron without studs looks well until just about the time it is being admired during the cooling process, when it invariably cracks along the edge of the weld.

This is easily understood when it is considered that steel has approximately four times the strength of cast iron and that the contraction strains cause the weld to pull away from the cast iron just beyond the welded joint. This definite location of the break is because the cast iron right under the weld has become chilled cast iron, whether it was originally so or not, and a sharp



METHOD OF STUDDING A BROKEN FLYWHEEL SPOKE PREPARATORY TO WELDING

demarcation of structure together with a possible layer of weaker cast iron causes the break invariably to take place in this layer of cementite. If, however, steel studs are properly proportioned in the face of the cast iron to be welded or adjacent to the joint, so that the weld cannot pull away from the cast iron, the cooling strains result in stretching the steel weld while the welded joint to the cast iron and steel studs is maintained as it was made.

To insure the proportioning of the studs so that the weld will not pull away from the cast iron it must be remembered that, as already remarked, steel has four times the strength of cast iron, and therefore the problem is so to proportion the studs that the ratio of the cross-section of the steel to the cross-section of the remaining cast iron will be somewhat less than four to one at any section subjected to cooling strains at one time. This in general is a very simple and easily applied method and means large studs for large sections and smaller studs for smaller sections. It requires common sense in placing the studs, together with welding experience. The writer has seen this studding method abused by men who evidently did not understand why they were using it, and no doubt to such unsuccessful work done by amateurs is partly due the prevaling opinion that the studs function simply as tent stakes. That this is not true can also be seen from the fact that steam-tight joints on cast iron can be made by this method, showing that the weld to the cast iron has been maintained to its full efficiency by the use of the studs.

Another useful application of studding lies in the use of large studs as an anchor nucleus for breakage of castings such as gear teeth. One, two or three of these large anchor studs, together with some smaller studs appropriately distributed, will provide weld strength for the cast iron as well as the shear and thrust strains necessary, while the weld, built up to size and machined off, will furnish a perfect wearing or bearing surface. This method of studding is applicable to cast steel also where the original section has not been adequate to stand the strain.

Details of the way in which this studding is accomplished not explained by the photographs are: First, "vee" out the crack on both sides of the break from the side which is accessible for welding, or half way from each side if both sides are accessible, saving enough of parts of the original break to keep the piece securely clamped in alignment. Before any of the welding is done the stud holes must be drilled and tapped with a bottoming tap and the studs screwed in tight, completely filling the hole for a distance of at least four times the diameter of the stud. A convenient way of doing this is to have a completely threaded rod screwed in tight with a Stilson wrench and to saw off $\frac{1}{4}$ in. to $\frac{3}{8}$ in. above the surface of the work, depending on the accessibility; that is, a narrow "V" should have the studs closer to the work than a more open one. The method of welding is as follows: Weld around the studs so that they become part of the cast iron, then weld between the studs crosswise or diagonally until the entire "veed-out" surface of the cast iron and the adjacent surface to form the under side of the pad are completely covered. They must at least be covered before proceeding with the main filling-in. Add metal one bead at a time so that no great section of the weld is cooled off in the molten state at any one time. The welding first of the stud to the cast iron makes the stud an integral part of the casting, and the welding from stud to stud diagonally or crosswise draws the casting together into its original contact, especially if a small amount of the original break is left intact at the bottom of the "V." This can be done in most instances unless one of the pieces is broken out and lost and must be replaced by casting or forging.

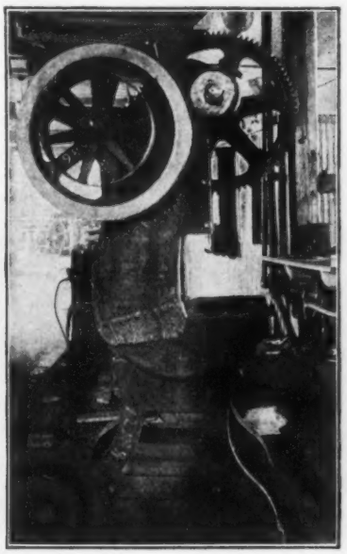
In this steel-studding process for cast iron, especially on cylinders and similar work, machining is usually required, and the hardened layer directly under the weld gives trouble unless grinding methods are used. There are other means of taking care of this hardened layer for machining on the surface, one of the newest of these being to finish the machined part with a nickel-copper electrode. This electrode has the property of so merging the cast iron that there is no hard layer of cementite formed. Such electrodes were developed by the automobile trade for repairing scored cylinders. An older method is to calk the bottom of the "V" with copper, which is machined off later. Probably the best method of all is to supply a bushing for the part to be finished. Many cylinders, especially with steam engines, are built with this bushing originally, and in welding the bushing is removed and perhaps slightly refitted after the welding job is completed.

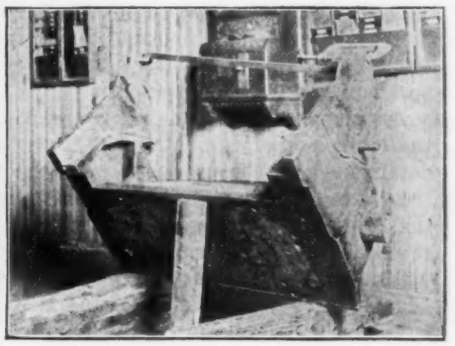
The studding of cast iron is not necessary where electric welding is used simply as a means of filling in or building out, or where grinding is the only machining necessary. In handling such work clean out the spot to be welded by chipping or grinding so that all dirty, oily, sandy or porous metal is eliminated and a reasonably bright metal foundation is provided for the weld. Weld with either steel or cast-iron electrode according to whether a reasonably hard or a very hard surface is wanted after grinding. The steel gives a hard surface and the cast iron a very hard surface. Care must be taken to use the cast-iron electrode in such a way that the quick cooling does not cause gas bubbles in the weld, leaving holes after finishing. The steel causes no such trouble, and if one or two imperfections show a peening hammer will close them up.

Another case where studding is not required is in the electric welding of cast iron where tensile strength is required but no resistance to bursting pressure as in welding broken machine parts, small bedplates, etc. In general, where no undue strain will result and the part was originally broken by an accident which will hardly happen again in the same place, "vee" out wide enough to enable the electrode to be held at approximately right angles to either face of the "V." Weld the two faces of the "V" separately with steel, using great care to have the steel united to the face as the arc progresses and not to let any of it run down ahead of the puddle. Weld from the bottom up, and if any of the deposited metal does escape stop and chip it off. After the two faces are successfully covered it is extremely easy to make a good weld from the steel faces, using steel or cast iron in the "V."

Another method which has a basic theory similar to that underlying studding and is especially useful for sections that are too thin to stud applies to such work as automobile cylinders, jackets, crank cases, heating boilers and other cast-iron parts complicated in shape and where no deformation can be allowed. This procedure is to run beads at right angles to the crack about eight or ten times the thickness of the weld at the crack. These right-angle beads, laced back and forth at intervals of four to six times the thickness of the piece, hold the weld and adjoining cast iron from separating, so that the contraction takes place in the weld, where it does no harm. In this manner automobile water jackets, crank cases, furnaces, etc., have been welded. Automobile water jackets have been welded in emergencies without taking the water out of the engine.

Sometimes the weld will be stressed beyond its elastic limit and will crack, but no precautions need be taken in regard to rewelding, as this crack will then have steel to hold it. Naturally, the less the heat used the less will be the stress to be taken care of. To that end use the light-work taps on the welding machine to insure there being as little heat as possible and proceed a little at a time, allowing each bead to cool completely before beginning the next one. In the case of filling in the beads at right angles to the weld, the beads should be put down as nearly as possible at the same time in order to fill in the space between the intermediate beads which are crosswise of the crack. In pieces that have cracked and sprung apart and should be brought into alignment this method of crosswise beading, proceeding from the smallest end of the crack, will bring the original pieces into such intimate contact that the metal is very often watertight before the intermediate beading is started. In order to keep the heat as low as possible special electrodes with a melting rate higher than that of ordinary steel should be used. This will aid materially in keeping down the stresses. All of this welding with steel is done without preheating or annealing. Thus the necessary finish being ground to size, it is possible to make welds that would not be practical with methods using preheating.





EXAMPLES OF ELECTRIC WELDING WORK WHICH IS DONE WITHOUT PREHEATING

Studding is unnecessary where great tensile strength is not required and the parts are free to align themselves without setting up excessive contraction strains due to the cooling of the weld. In the welds shown, however, studding has been used.

C. J. HOLSLAG,
Chief Engineer.
Electric Arc Welding & Cutting Company,
Newark, N. J.

Synchronous Motors for Raising Power Factor of Industrial Plant

WHILE studying methods of raising power factor an investigation showed that there are many industrial plants where synchronous motors may be used in only one or two places and these motors must correct the power factor for the entire plant. Motors for such service should be designed in virtually the same way as synchronous condensers—that is, to operate at nearly zero per cent power factor—since the mechanical load in many cases may be quite small. For most of these applications either a direct-connected or a belted exciter should be used. The starting and control of these motors may now be made almost as simple as that of a squirrel-cage induction motor. In fact, there is quite

an interest shown at present in automatic starters for synchronous motors, and these will undoubtedly tend to increase the use of synchronous motors in plants where it had previously been thought that there was not sufficient skilled labor for their operation.

C. W. DRAKE,
General Engineer.
Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa.

Calculating the Size of Lighting Units

CALCULATION of the proper size of lamps to use for lighting depends to a very large extent upon the good judgment of the illuminating engineer. A recent case that came to the writer's attention called for lighting a number of offices which consisted of remodeled rooms in an old dwelling house. It was not known either what the arrangement of desks or what the colors and finish of the paint of the walls and ceilings would be. The rooms were only 8 ft. 6 in. high, and consequently the lamps had to be rather close together and of small size. Accordingly they were placed at the corners of rectangles 8 ft. x 8 ft. 6 in. in size.

It was decided to have the intensity of illumination somewhat above the minimum fixed by the Pennsylvania code of lighting, which is 3 foot-candles. This code recommends that from 4 to 8 foot-candles be used and also requires that lamps shall be suitably shaded to minimize glare. In order to meet this last requirement it was thought that a fixture with a semi-inclosing opal bowl would be appropriate.

An important factor in illumination calculations is the coefficient of utilization. Values for this factor are determined by the proportions of the room dimensions, the colors or reflecting values of walls and ceiling and the type of lighting fixture. Tabulated data from researches to determine values for coefficients of utilization may be found in a paper on "Industrial Lighting" by Ward Harrison and H. H. Magdsick which is issued as a bulletin by the National Lamp Works of the General Electric Company. The correct application of these data to any particular case depends on the judgment of the illuminating engineer. In the case under notice it was judged that the conditions regarding walls and ceiling would be the average obtaining in an office, and therefore the coefficient of utilization was taken as 0.50.

Another factor which depends upon the good judgment of the designer and the conditions in the locality where the lighting fixtures are to be used is the depreciation factor. This value depends upon the amount and character of the dust suspended in the air, which will come in contact with the reflecting surfaces and transmitting glassware, and also upon the probable frequency of cleaning the fixtures. This office was in a rather dusty city, and the depreciation factor was taken as 1.25. Knowing these factors, the flux required was calculated from the following formula: $F = (E \times S \times D) \div (K \times N)$, in which:

E = foot-candles,
S = area illuminated (square feet),
N = number of lamps in area,
K = coefficient of utilization, and
D = depreciation factor.

Substituting the known values in the formula $F = (8 \times 612 \times 1.25) \div (0.50 \times 8) = 1{,}280$ lumens, which is the average flux per lamp required to give an illumination of 8 foot-candles. The output of a 100-watt, 110-volt "Mazda C" lamp is 1,260 lumens, which is very close to the desired value. Substituting this value of 1,260 lumens in this equation and solving for the illumination, the result is 7 foot-candles. Consequently these lamps were used mounted in "type MB Brascolites."

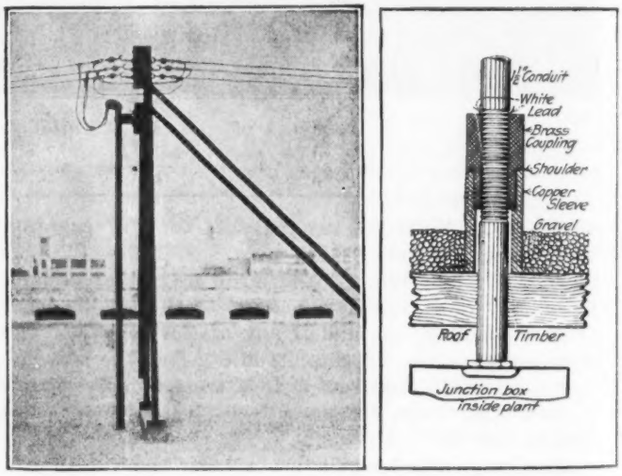
After two months' use without cleaning, the average useful illumination in the offices as obtained by photometric tests was found to be 4.5 foot-candles, the minimum 3 and the maximum 5.7 foot-candles. The difference between the calculated and actual results indicates that the values used for depreciation factor and coefficient of utilization were not correct. The coefficient of utilization should have been higher and the depreciation factor should have been lower.

D. W. BLAKESLEE,
Pittsburgh, Pa. Consulting Engineer.

Waterproof Anchorage for Roof Cables

TO SUPPORT a span of No. 0, 550-volt, three-phase circuit 125 ft. long on the roof of the Graton & Knight Manufacturing Company's plant at Worcester, Mass., the writer has developed the angle-iron structure shown in the accompanying photograph. A main frame of 2-in. x 2-in. x ¼-in. angles was provided, 36 in. wide and 10 ft. long. A 4-in x 6-in. cross-arm at the top carries six strain insulators as shown with the usual loops. Diagonal braces anchor the upright section and stiffen its construction. The leads to the interior of the factory are tapped off for each department through a 1½-in. pipe, with drip loop, and terminate in a junction box inside the building.

An interesting feature of this construction is the means used to make it waterproof. As shown in the accompanying sketch, the pipe carrying the conductors



ROOF SUPPORT FOR 550-VOLT, THREE-PHASE LINE AND WATERPROOF ENTRANCE FOR 1½-IN. CONDUIT

is screwed into a brass coupling, and the pipe section from below is similarly fastened with its end brought flush against the downward section of pipe. A shoulder was turned on the coupling at its lower end, and to this shoulder was soldered a copper sleeve which terminates in a flange carried down beneath the roof gravel and fastened to roof boarding. The entrance of the pipe to the coupling is white-leaded.

A. H. MAGNUSON,
Graton & Knight Mfg. Co. Electrical Engineer.
Worcester, Mass.

Central Station Service

A Department Devoted to Commercial Policy and Management Topics, Including Methods of Increasing the Use of Electric Light, Power and Heat

"Collier's" Asks a Square Deal for Public Utilities

PLAINLY the utilities are to receive a fair hearing in the court of public opinion. Reproduced here is an editorial page from *Collier's* for March 12 in which the editor puts before his readers the difficulties which confront the executives of every public utility today and

Collier's
THE NATIONAL WEEKLY

A Square Deal for Public Utilities

OF all the bills that come to you on the first of the month, which do you pay least willingly? Are not the two that excite the most distrust the gas bill and the electric-light bill?

There is an explanation, somewhere, of the lack of good will shown by the average community toward the public-utility company that serves it with light, heat, and power. One reason, we think, has never been fully stated: *If the power and light companies were owned and controlled by one or two men, and named after people, as the majority of our big enterprises are, we would be apt to have a more friendly feeling toward them.*

If you received your electric-light statement from the "Smith & Jones Electric Light Company," and you thought it too big, you could go down to see Mr. Smith or Mr. Jones and feel that you had talked to headquarters. Perhaps Mr. Smith or Mr. Jones would be neighbors of yours. Perhaps their wives would know yours, or their children would go to school with yours. They might belong to your club, or fish in the same lake, or shoot over the same marsh, or drive the same kind of automobile that you do. You would have no trouble understanding each other.

But when you get a bill from the "Park Falls and Twin County Power and Light Company," and it strikes you as being exorbitant, you feel that there is no one to whom to kick about it. The president of the company is probably only a minor stockholder. The directors are men of large affairs, no one of whom is in control. The majority of the stock is probably owned by investors scattered all over the country who may be as dissatisfied as you are.

The average employee of the average public utility knows that the company is looked upon with some hostility, and that its affairs are regulated by some commission, and that the company is continually called upon to explain, to customers like yourself, reasons why there could be no mistake in your last statement. He gets in a bad frame of mind, and perhaps ends the argument by saying, "If you don't pay this bill by the 10th, we will have to take out your meter."

A statement was made, a few weeks before this is printed, before a meeting of the Chamber of Commerce of the United States in Washington, that it will require $852,500,000 properly to equip the 1,250,000 houses and apartments which this country now needs with heat, light, transportation, and telephone facilities. This must come from the big and little pools of people's savings, and these pools will yield investment money only when tempted by securities which guarantee a fair return.

One of New York's newspapers has lately been printing letters from the chairmen of public-service commissions of different States which tend to show that the outlook for public-utility securities is on the mend, that public-utility problems are gradually being taken out of politics, and that a better public attitude toward public-utility enterprises is being developed. But haste is being made slowly.

As Collier's said some weeks ago, the American people have been "stung" a good many times by financial buccaneers in the public-utility field. That is no reason, however, why we should close our eyes to the marvelous achievements, as a whole, of our public-utility companies. Let us look at some of the high lights.

Thirty years ago we were just beginning to apply electric energy to transportation.

The first "third rail" ran at the World's Fair in Chicago in 1893. "Horsepower" as a unit of measurement was adopted by James Watt over a hundred years ago. If a horse delivers a horsepower.

A Little Speed, Please

This thing of living in the garage until they get the house finished has its decided disadvantages

than it would take nineteen million of the twenty-one million horses in the United States to furnish the power now supplied by central stations. In 1902 less than a million and a half would have sufficed.

The average person now uses more than twelve times the amount of electricity that he used eighteen years ago.

In 1900 there were few of the high-voltage transmission towers which you now see crossing the country, and in those days ten thousand volts were carried on the wires with some anxiety. To-day equipment is under construction to enable wires to carry 220,000 volts along these rows of steel sentinels of progress.

Here is the money side of it. There are approximately 1,400,000 investors in electrical securities, and more than $300,000,000 of public funds in the hands of insurance companies and $1,700,000,000 in bank funds are invested in public-utility companies.

Such big figures are staggering. But in asking ourselves, as individuals, whether or not our attitude toward the particular public-utility company which serves us is fair, let us read what Dr. Steinmetz, probably our foremost electrical authority, said in a speech at Baltimore last January.

We have only begun the use of electricity in the home. The use of electric ironing machines, washing machines, and devices for cooking and heating by electricity will grow tremendously. In the future mines will be electrified and the cost of coal will be reduced, and with that reduction will come a reduction in the cost of current. Electricity will be used in the home much more than it is now, and that will help to solve the servant problem.

And here is the most significant thing that he said:

You notice that during the war, when everything else went up, the cost of electricity remained low.

America must move forward, and the speed and comfort with which she moves will depend in a large measure upon her ability to produce, at low costs, heat, power, and light. Let each community give some thought to its public-utility situation, to the end that we may more quickly give a square deal, not only to the hand that lights the gas stove or turns on the electric switch, but to the investment pocketbook which furnishes the capital as well.

AN EDITORIAL PAGE FROM "COLLIER'S"

from his unbiased viewpoint asks that a square deal be given to the public utilities. Without taking up the cause of the utilities as such it is pointed out that national expansion, increased housing facilities, industrial growth and general public convenience depend largely upon how well the public utilities are able to meet the additional requirements.

"America must move forward," concludes the editorial, "and the speed and comfort with which she moves will depend in a large measure upon her ability to produce, at low costs, heat, power and light. Let each community give some thought to its public utility situation, to the end that we may more quickly give a square deal, not only to the hand that lights the gas stove or turns on the electric switch but to the investment pocketbook which furnishes the capital as well."

Such a constructive attitude as is thus shown by *Collier's* is a long stride forward in the public relations problems of the utilities. It augurs well for a real appreciation of these problems by the public and it is also proof that the educational work which is carried on by the electrical industry has not fallen upon barren ground.

Boston Edison Company Establishes Suburban District Managerships

IN ORDER better to co-ordinate the relations between itself and the local publics in various parts of its territory of some 750 square miles, the Edison Electric Illuminating Company of Boston has recently established a number of suburban district managerships under the broad supervision of W. H. Atkins, general superintendent of the company, and under the immediate direction of J. M. Bassett, who has been made head of the department of suburban district managers. The district managers have been appointed to enable customers, municipal officials and persons concerned with or interested in the company's service to become acquainted and deal directly with a responsible official of the company who is in close touch with local conditions and empowered to represent the company and carry out its policies along broader lines than is feasible with minor-placed employees.

The duty of each district manager is to please all the customers in his district. The company desires each community served by it to feel that its interests are continually looked after by an alert and efficient official of the company and that their affairs are not left in the hands of minor agents. The district managers endeavor to make their presence felt, seeking ways to serve the customer, anticipating his wants and acting without display.

It is aimed to make the service so efficient that if any question should arise in the community adverse to the company the answer would be: "I have always found them ready, effective and willing. I see no reason to think that any other company or arrangement could do better."

It will be the duty of each district manager to impress upon the people of his district the high reputation of the company for business ability and fair dealing. Each district manager is provided with a headquarters which becomes the local Edison office in his territory. Often it is on the premises occupied by an Edison appliance department store. The solicitation of business and commercial activity as such are not scheduled duties of the district managers. The appointees to date are these: E. F. Booth, Waltham; F. E. Randall, Woburn; A. J. Ashe, Chelsea; F. L. O'Bryan, Framingham; J. H. Kent, Newton; J. W. Swain, Arlington; W. E. Holmes, Walpole; H. W. Jones, Somerville, and F. W. Shaw, who is still unassigned.

California's Fifth Electrical Home

FIVE electrical homes have been successfully conducted by the California Co-operative Campaign since last June, when the first one was opened in San Francisco. Reproduced here are views of an adobe electrical home which was open in Los Angeles from Jan. 20 to Feb. 13 and was visited by 75,000 people in that time. This "home electrical" differed from the previous ones in the other cities in that the house was built of adobe and it is the first time that this material has been used for the construction of a modern home.

Of the 75,000 people who visited the adobe electrical home during the three weeks it was open, 50,000 made a careful inspection of each room. The other visitors confined their attention to the first floor only, where the majority of the electrical conveniences were installed. On the last day that the house was open to the public 6,900 people inspected it.

The home electrical campaign is being conducted by the California Electrical Co-operative Campaign as a demonstration to a community how to build, wire and equip a house so as to obtain the maximum use of electricity in every room twenty-four hours a day.

Points to Consider in Adjusting for Customers' Power Factor

THE chief object of a power-factor rate clause is generally to better power-factor conditions, not to produce additional revenue. Its purpose should be to avoid discrimination and to increase net earnings by reducing operating costs. The power-factor problem still appears to be an engineering problem, and a great deal must be done by engineers, metermen and operators before power-factor correction can be embodied in a rate schedule in a clear, sound and workable manner.

Successful rate making embodies not only the factors of cost of service and the value of the service, but also considerations of public policy and other elements which are not subject to exact measurement and weight. To begin with, the unfortunate word "penalty" should not be used even among central-station men. Failure of a customer to meet a given requirement may call for a correction or adjustment, but never a penalty. Every effort should be made to work out the situation with each customer without any measures that may even seem harsh. If an adjustment against a customer is justified in the case of subnormal power factor, it would seem that the reverse condition would call for an adjustment in his favor.

Where is the level or the percentage of power factor which may be deemed satisfactory and require no adjustment? Is it 80 per cent or something higher or lower? Is it the same for all classes of consumers, large or small, or is it the same for every generating, transmitting and distributing system? Is the figure for a company distributing locally different from that for a company with extensive transmission systems feeding local systems from a number of generating stations? These questions merit careful consideration.

In applying a power-factor correction to a demand-rate schedule should the correction be made on the demand charge only or on the energy charge only, or should it be applied to both, and if so in what proportions?

This immediately raises a question as to the effect of power factor on the cost of service. Is its effect chiefly to current losses, and if both effects are noted, then in what class of costs is its effect the more important? Again, are these effects or cost of service the same in different generating and distributing systems?

Assuming that a power-factor correction is agreed upon and assuming that proper instruments are available for measuring the power factor, then a question arises as to the application of the correction. Shall it be the power factor determined at the time of the customer's peak load, the company's system peak or an average over the week or month? The last method is probably the fairest, all things considered.

Power-factor corrections are necessary, but it is a debatable point whether or not power-factor clauses should be embodied in the rate schedule. For instance, there is one company which has 150 customers with demands varying from 50 kw. to 10,000 kw. These customers pay an aggregate bill of about $3,500,000 per annum.

Most of the customers have been purchasing their power for a number of years, and with the exception of possibly twelve or fifteen the power factors of this group of customers are quite generally satisfactory. The company has been working steadily with these 150 customers to get power-factor conditions bettered, and the twelve or fifteen customers mentioned are those who cannot or will not do anything to better their power-factor conditions. Should the company insert in its rate schedule a clause aimed solely at these few customers and stir up the entire 150, or should the customers who will not or cannot meet reasonable power-factor requirements be made to go on some other rate schedule?

This entire problem should be carefully analyzed by each company, according to F. A. Newton of Hodenypl, Hardy & Company, Jackson, Mich., who presented these ideas on power-factor correction at the Cleveland meter conference of the Ohio Electric Light Association.

Smaller Volume of New Business Brings Increased Revenue per Kilowatt-Hour

NEW business obtained by the Metropolitan Edison Company, Reading, Pa., during 1920 is shown in comparison with that of the year previous in the following table:

	1919	1920
Number of old houses contracted for	1,319	2,449
Number of new houses contracted for	201	190
Number of commercial houses contracted with	335	539
Number of power customers contracted with	89	121
Total number of new customers	1,944	3,229
Additional light and heat, in kilowatts	3,912	2,184
Additional power, in horsepower	10,200	4,879

Analyzing the figures, which show increases in the number of new customers and contracts taken but decreases in the total connected load, the company states:

"While the volume of new business contracted for during 1920 has not been so great as in the year 1919, yet it is worthy of note that the number of old houses contracted for is nearly twice that of 1919 and the number of new houses is nearly the same. This will indicate a larger revenue per kilowatt-hour sold for the business done in the year 1920 than for the business done in the year 1919, as all residential lighting is sold on a straight 10-cent rate, whereas the average rate for commercial power is about 3 cents."

Tenney Companies Hold Sales Conference at Boston

ABOUT twenty-five representatives of the associated companies managed by Charles H. Tenney & Company, Boston, attended a sales conference in that city Feb. 24. Cyrus Barnes, general sales manager, presided.

Among the topics discussed were definite sales plans for 1921, importance of territorial analyses and education of plumbers and of electrical contractor-dealers in the handling of appliances. Representatives from the George M. Clark Company, Weir Stove Company, Hoover Suction Sweeper Company, Eureka Vacuum Cleaner Company, Westinghouse Electric & Manufacturing Company, Landers, Frary & Clark, Ruud Manufacturing Company and the Surface Combustion Company gave instructive addresses at the convention on methods of securing business. At the close of the meeting the announcement was made that Charles H. Tenney & Company, in appreciation of the sales effort for 1921, would donate a silver cup to the company showing the best sales results, a cash prize also to be presented to the sales force.

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Five Thousand-Kw. Rotary Converter.—F. HARTIG.—For the drive of their electric rolling mills the Peiner works have been using six motor-generators to convert 10,000-volt three-phase current into direct current. An order was placed in 1913 with the Siemens-Schuckert works to erect one, and later a second, large rotary of 5,000-kw. direct-current output, to supplant the motor-generators. A water-cooled 5,000-kva. transformer reduces the 10,000 volts to 384-volt, six-phase current, operating at full load and unity power factor with 98.35 per cent efficiency. The huge rotary has twenty-eight main poles, commutating poles, an auxiliary compounding and damping winding, six double-collector rings and a 185-kw. direct-current starting motor, clutch-coupled. The machine is designed for 215 r.p.m., and gives at full load 9,600 amp. at 520 volts, direct-current. Including the losses in the main transformer and the 265-kva. induction regulator, the rotary gives an over-all efficiency of 94 per cent, whereas the old motor-generators operated with only 81 per cent, resulting in an annual saving of about 5,000,000 kw.-hr.—*Elektrische Kraftbetriebe und Bahnen,* Jan. 10, 1921.

Temperature Rise in Headlight Generators.—Experimental data are offered to show that excessive armature heating in these units had been due to excessive brush pressure.—*Railway Electrical Engineer,* February, 1921.

Lamps and Lighting

Gas Lighting, Past, Present and Future.—HOWARD LYON.—The writer deals with modern developments in incandescent gas lighting. He gives information concerning mantles, kinds of gas used and their value for illumination purposes.—*Transactions Illuminating Engineering Society,* Feb. 10, 1921.

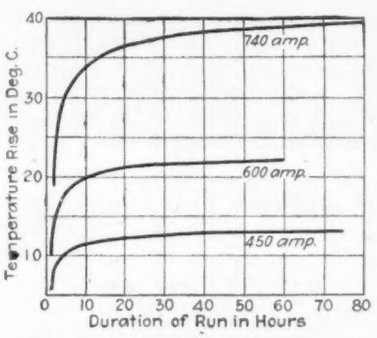
An Examination of the Munsell Color System. —IRWIN G. PRIEST, K. S. GIBSON and H. J. MCNICHOLAS. —Results of extensive measurements of spectral reflection of colored card standards submitted by the Munsell Color Company. The determination of total reflections for sunlight from these curves and the relation of these reflections to the Munsell scale were arrived at, and recommendations were made for the improvement of the system.—*Technologic Paper No. 167, U. S. Bureau of Standards.*

Generation, Transmission and Distribution

Suspension Type of Transmission-Line Insulators.—ALFRED STILL.—The writer considers the use of static shields and arcing horns in changing the potential gradient across the units of certain strings. He deals with the characteristics of thick porcelain units and also the link type of units in which there is no cement used.—*Electrical Review,* Jan. 22, 1921.

Information on Powdered Coal and Briquets.—R. DAWSON HALL.—Extensive data are given on the results of boiler trials made at pulverized fuel plants at the Lykens colliery. Low carbon dioxide is said to be not inconsistent with efficiency. The Bethlehem Steel Company, the article reports, has for years used pulverized coal to advantage.—*Coal Age,* Jan. 6, 1921.

Research on the Heating of Buried Cables.—This report is divided into several sections. A short summary of the history of the investigation and a statement of the work still outstanding are first given. Section 1, by S. W. Melsom and Miss V. Cockburn, deals with the work done at the National Physical Laboratory on paper-insulated cables laid under various conditions. Section 2 consists of a report by E. Faussett on work at Newcastle-upon-Tyne on extra-high-pressure paper-insulated cables laid direct in the ground at different depths. Section 3, by Prof. E. W. Marchant summarizes tests at Liverpool University on vulcanizing bitumen cables laid solid in stoneware troughing. Considering paper-insulated cables, considerable data are offered, first for cases where the cable is laid in air. Curves show the temperature rise in the lead and in the core at different voltages and for various periods of run. The effect of color of paint on the cable suspended in air is also shown. The curves give the temperature rise in a cable 0.6 sq.in. (3.9 sq.cm.) in section laid solid in bitumen in stoneware troughs.—London *Electrician,* Dec. 24, 1920.



TEMPERATURE RISE OF CABLE LAID IN BITUMEN

Installations, Systems and Appliances

Electricity on Merchant Ships.—E. D. DICKINSON.—In considering electric service on merchant ships continuity, or reliability, is probably the most important consideration, since interruption of service can be directly translated into dollars lost. Another factor is the operating cost in dollars per ton-mile of cargo transported. This cost has increased so radically in the last few years that efficiency of operation is more important now than in the past. Means of improving the efficiency of operation are discussed in detail.—*General Electric Review,* February, 1921.

Heating Rivets by Electricity.—J. R. BOWER.—The heating of rivets electrically is, the author asserts, fast supplanting the older coal, coke, oil and gas methods. The energy required to heat 100 lb. of rivets regardless of size has been found to be from 10 kw.-hr. to 20 kw.-hr. With energy from 1 cent to 2 cents the maximum cost per 100 lb. of rivets would be less than 40 cents. Experience with the oil method shows that with

oil at its present price it would cost about $2 per 100 lb. to heat the rivets by this method. It is said that coke is even more expensive. Advantages aside from the cost economy are also shown for electrical systems.—*Journal Engineers' Club of Philadelphia*, January, 1921.

High-Speed Turbine Drive of Merchant Ships.—ESKIL BERG.—Three methods of applying the turbine to the drive for ships are considered: (1) The turbine directly connected to the propeller shaft. This method involves a serious sacrifice in the efficiency of both turbine and propeller on account of the low speed. (2) A gear train interposed between the turbine and the propeller. (3) The substitution of what might be called an electrical gear in place of the mechanical gears

For the Navy:	Hp., Each.	Total Hp.
One collier	7,160	7,160
Four battleships	32,000	128,000
Two battleships	60,000	120,000
Four battle cruisers	180,000	720,000
Total		975,160

For the Merchant Marine:	Hp., Each.	Total Hp.
Twelve freighters	3,000	36,000
Four coast guard cutters	2,600	10,400
One fruit steamer	3,000	3,000
One express passenger vessel	3,000	3,000
Total		52,400

of method 2. In this case the turbine is designed so as to secure the highest efficiency in the operation of an electric generator, and the driving motor, which is directly connected to the propeller, is in turn designed solely for that purpose. All reversing is done without reversing the turbine. The advantages of the electric system are discussed particularly, and the accompanying table is given to show the extent of electric drive furnished by the General Electric Company.—*General Electric Review*, February, 1921.

Electrophysics and Magnetism

Hysteresis Effects with Varying Superposed Magnetizing Forces.—W. FONDILLER and W. H. MARTIN.—An analysis of the causes of "flutter" in composited telephone lines is given by the author. To obtain a quantitative measure of the flutter tests were made to determine the effects of telegraph currents on the transmission of single-frequency currents in the telephone range. The conclusion was that the flutter is complementary to a suppression of the hysteresis normal for a magnetization by telegraph currents. An empirical formula is given which states the relation between flutter and telephone and telegraph currents.—*Journal A. I. E. E.*, February, 1921.

Some Applications of the Method of Images—I.—JAKOB KUNZ and P. L. BAYLEY.—In the first part of the paper the authors have obtained expressions for the potentials at any point between an infinitely long charged wire and two conducting infinite planes parallel to it for the surface density of the induced charge at any point on the planes and for the capacity per unit length of such a condenser. These expressions contain only circular and hyperbolic functions. The authors then take up the case of a charged wire inside an infinite rectangular tube and of two or four charged wires inside a rectangular tube.—*Physical Review*, February, 1921.

Determination of Heat Dissipation Coefficients of Iron and Copper.—K. LUBOWSKY.—The heat dissipation coefficients of iron and copper bodies, in air and in oil, stationary and in motion, influenced by different paints and insulating materials, are determined in watts per square centimeter for 1 deg. C. temperature rise. A standard-size plate or cylinder of copper and iron was used for all tests. The metallic body was uniformly heated by eddy currents caused by a 500-cycle alternating-current field, and the rate of cooling off was measured by means of copper-constantan thermocouples, soldered directly on the metal. A number of curves and tabulations, giving test data obtained, are given.—*Elektrotechnische Zeitschrift*, Jan. 27, 1921.

Electrochemistry and Batteries

Electro Industry of Sweden.—SIGURD HALDEN.—A census of the power resources of Sweden, data on its power stations and transmission lines, electric railways, electrochemical and electrometallurgical industry and a general description of the magnitude of the different branches of the electrical industry are given.—*Elektrotechnische Zeitschrift*, Jan. 6, 1921.

Electric Furnace Smelting of Montana Manganese Ores.—E. S. BARDWELL.—An account of the plant of the Anaconda Copper Company for reducing the Montana rhodochrosite manganese ores chiefly from the Butte district. Detailed description is given of the furnaces, the electrode holders and the operation of the furnaces. A test made on a half-and-half mixture of ores from the Philipsburg and Butte districts indicated the useful efficiency of the furnaces tested to be 71.7 per cent. Of the losses sustained 40 per cent was due to radiation and 60 per cent to the electrical losses in transformers, conductors, electrodes and contacts. The composition and properties of the slags are discussed; also volatilization losses and the possibility that some are due to formation of carbonyls of iron and manganese.—Paper presented before meeting of the American Electrochemical Society, Oct. 2, 1920.

Miscellaneous

"Electric Week" in Hanover.—The Verband Deutscher Elektrotechniker during the last week of September held a big electrotechnical convention in Hanover. All the more important German associations of electro-industrial engineers had been invited to attend. A number of important lectures were given, and at a special meeting with the V. D. E. a series of standardization rules for electrical machinery and appliances were officially adopted. Tentative drafts for the standardization rules have been published from time to time in the *Elektrotechnische Zeitschrift*, and reference has been made to some of them in these pages. An account of the proceedings of the meeting and also a list of the adopted standardization rules, including some minor changes, voted by the meeting, may be found in the *Elektrotechnische Zeitschrift*, Oct. 21, 1920.

Vibration.—JULIUS FRITH.—An analytical treatment, including vibrations occurring in crankshafts, flywheels and alternating-current generators. Vibration or hunting of alternators when connected in parallel slightly out of synchronism is also considered.—London *Engineering*, Nov. 12, 1920.

American Wood Preservation Methods.—BOYER.—A résumé of methods used in America for protecting wooden poles against decay through the application of disinfectants by means of a brush, by immersion of the poles and by injection. The author has recently returned from a trip to America and has made a special study of preservation proceses used in this country.—*Revue Générale de l'Electricité*, Nov. 13, 1920.

Scientific and Industrial Research

(PRINTED IN THE THIRD ISSUE OF EACH MONTH)

A Department Devoted to Reports of Investigations Contemplated or Completed, Research Facilities Available, and Suggestions for Co-operative Work.

Conducted by PROF. VLADIMIR KARAPETOFF
Cornell University, Ithaca, N. Y.

Research in Progress and Completed

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

ELECTROPLATING, CO-OPERATIVE RESEARCH IN.

The Bureau of Standards is at present engaged in co-operating with the Electroplaters' Society in discussing the possibilities for research in electroplating, especially that which may be carried out by co-operation with manufacturers and chemists during a period when there is relatively little industrial activity. It is hoped that through direct and personal association with the Electroplaters' Society the bureau may make its work more immediately useful and secure a more extended application of new methods in everyday electroplating practice, as well as become better acquainted with the problems and possibilities of the situation.

FURNACE, ELECTRIC, ROTATING TYPE.

The usual stationary furnace of the arc type is not quite satisfactory for melting alloys of copper, aluminum and volatile metals, because of the concentrated heat of the arc, which evaporates valuable constituents such as zinc, and because it is not possible to provide a thorough mixing of the charge, which is necessary for a uniform product. A rotary furnace has been developed and tested in which these drawbacks are largely eliminated. It consists of a lined steel drum or cylinder with its axis horizontal. A carbon electrode projects into this melting chamber from each end. The furnace rests on four rollers, two of which are driven by an electric motor through a worm gear. Thus the melting chamber and charge can be continuously rotated in either direction, insuring thorough mixing and avoiding concentration of heat in one part of the charge. The drum is provided with two copper rings which bear on contact shoes, and through these the current is carried to the electrodes. One of the electrodes may be provided with an electric motor for automatic control and temperature or current regulation. With heavy material the furnace is held stationary for a short time after turning on the power in order to prevent breakage of the electrodes.—*C. H. Booth, Chicago.* (N. B.—Several of these furnaces are in operation with apparently satisfactory results.)

FUSE, CARTRIDGE-TYPE, WITH CEMENT BLOCKS.

A renewable cartridge-type fuse has been designed and tested, in which the fusible wire passes through several cement cylinders with small spaces in between. These cement blocks take the place of the usual filling in an inclosed fuse. Tests have shown that with low-power short circuits the metal is vaporized only in the small exposed portions between the blocks, the protected portions being cooled by the cement. With a violent overload the entire wire is melted and absorbed by the porous cement, which, however, remains intact and protects the fuse container from carbonization and blisters. Since the wire melts in several places simultaneously, there is no persistent arcing. The number of melted places depends upon the voltage across the fuse, so that the fuse may be called "articulated" with respect to the voltage. The amount of fusible material and of air space in its vicinity has been reduced to a minimum and the container is made substantially airtight.—*H. E. Trent Lansdowne, Pa.*

FUSE, RENEWABLE, LINK-TYPE.

A fuse has been developed in which the fusible element is a renewable link. This link is inserted in the fuse tube, which is closed at both ends by screw caps. A slotted washer is provided at one end to hold the link in definite place, and there is a recess in the cap to allow the molten metal after the blowing of the fuse to collect without interfering with the removal of the cap and renewal of the link. The links are made narrow in cross-section at two points so that these points will melt first and minimize the explosive gases generated by the melting. —*Bussman Manufacturing Company, St. Louis.*

HYSTERESIS, VARIATION OF, WITH MAGNETIZING FORCE.

An investigation has been made to ascertain whether or not analytical expressions similar to the reluctivity relationship of Kennelly represent the variation of residual induction, B and coercive force, H_c, with the maximum magnetizing force, H_m. Hysteresis measurements were made on a large number of samples, using a wide range of materials and using magnetizing forces up to 2,500 gausses. The relationship $H_m/B_r = a_1 + b_1 H_m$ and $H_m/H_c = a_2 + b_2 H_m$ were found to hold within the limits of the probable experimental error.—*R. L. Sanford and W. L. Cheney, Bureau of Standards, Washington, D. C.*

LIGHT, DETERMINATION OF STANDARD WHITE.

Ordinary incandescent light sources give out reddish or yellowish light, and it is not possible to operate an artificial light source to "color-match" sunlight, on account of the very high temperature involved. A source of light at a higher temperature than that required to color-match sunlight would probably appear blue relative to the sun. The question arises at what temperature a source would appear neither blue nor yellow but white, and, in reference to this standard, whether the sun is blue, yellow or white? The first accurate experiments recently performed gave the following results: The theoretical temperature at which a source of light might evoke the hueless sensation of brilliance called white would be about 5,200 deg. (absolute) C. The light of the average noon sun at Washington very closely approximates white. —*Bureau of Standards, Washington, D. C.*

MAGNETIC TESTING OF TWIST DRILLS.

A co-operative investigation is being carried out by the Bureau of Standards and the American Society for Testing Materials on the testing of twist drills by magnetic analysis. The steel has been carefully prepared and tested for homogeneity by magnetic methods. The drills are to be manufactured from this steel under carefully controlled conditions and tested magnetically and mechanically. An attempt will be made to correlate the mechanical performance of the drills with the results of the magnetic tests. The ultimate object is the development of apparatus which can be used in a commercial way for the non-destructive testing of twist drills. The apparatus for the tests is in progress of construction, and no data are yet available.—*Bureau of Standards, Washington, D. C.*

PHOTOMETER, MICROSCOPIC, FOR MEASURING PHOTOGRAHIC DENSITIES.

A new microphotometer has been developed for use in measuring photographic densities. It has been used for measurements of the wave lengths and densities of spectral lines, for the measurement of the energy distribution in a broad spectral line and the spectral sensitivity of photographic plates. Measurements of the photographic density, when the plate is illuminated in parallel lines, have been found to be much larger than in diffuse illumination, calling attention to the importance of specifying the character of illumination when measurements are to be made on the light transmission of diffusing media.—*W. J. Meggers and F. D. Foote, Bureau of Standards, Washington, D. C.* (N. B.—This will be of interest in the study of diffusing glassware.)

Suggestions for Research

COMPUTATIONS PERFORMED ELECTRICALLY.

Just as electrical phenomena can be represented by mathematical equations, many mathematical equations and relationships may be imitated by electrical phenomena. For example, a direct-current network of conductors with unknown currents is reduced to a system of simultaneous linear equations representing Kirchoff's laws. Conversely, for a given set of such equations an electrical network may be constructed in which the emfs. and the resistances will correspond to the known coefficients in the equations. The unknown quantities may be read directly on ammeters in the respective branches. Thus a complicated system of equations can be solved by simply setting an electrical device and reading the answers on indicating instruments. It is quite possible that more complicated computations could be similarly performed and even linear differential equations solved by means of transient electric phenomena recorded on oscillographs. The motto is "Let laws of nature do your work." Those interested in this problem will find some interesting information in an article by A. W. Wright on "Electrical Methods for Solving Equations," *Philosophical Magazine*, Vol. 18 (1909), page 291.—*Editorial Suggestion.*

INSULATING VARNISH AND COMPOUNDS.

The subject of insulating varnish and other similar materials is of prime importance to builders of electrical apparatus and one to which has been given a great deal of thought and study by electrical engineers and chemists, but as far as we know this information has not been very well checked for guidance in handling various insulation problems which come up. For instance, the vacuum process for impregnating windings and coils could well be considered as to its limitations, advantages and disadvantages for the various classes and sizes of apparatus, even as well as with regard to the kind of impregnating material which should be used and the properties of this material, both electrically and mechanically, its life, etc. Another well-known process for insulating motors, the dip-and-bake process, could be considered, first, as to best temperature for baking; second, as to the proper insulating material to be used under various conditions; third, as to the physical and chemical characteristics of varnish or impregnating material and its life under varying conditions.—*J. L. Hamilton, St. Louis, Mo.*

MAGNETIZATION CURE, DUE TO SUPERIMPOSED MMFS., FORM OF.

The determination of the actual form of the magnetization curve under the action of two magnetizations presents an interesting field for further investigation. The most direct mode of attack appears to be the use of the Braun tube to obtain the dynamic magnetization curve in a manner similar to that employed by Madelung. Such an investigation could give data on the total hysteresis with two or more magnetic forces acting simultaneously. With a number of superposed magnetic forces differing in their magnitudes and rates of change the problem is further enlarged to the determination of the interaction of any two of the forces in the presence of the others.—*W. Fondiller and W. H. Martin, Western Electric Company, and American Telephone & Telegraph Company, Research Laboratory, New York City.* (N. B.—This problem is of importance in connection with the so-called "flutter" in telephonic transmission. See a paper by the authors in the *A. I. E. E. Journal*, 1921, page 149.)

PRESSURE INDICATOR, FOR HIGH-SPEED GAS ENGINE.

An ordinary indicator used for drawing pressure-volume diagrams of medium-speed reciprocating engines is not suitable for high-speed gas engines on account of the unavoidable inertia of its parts. An indicator is desired operating on an electrical principle—for example, of the nature of a stretched-wire oscillograph or a cathode-ray oscillograph—by means of which instantaneous pressures in a cylinder could be recorded practically without any time lag. The problem is essentially that of devising an arrangement by means of which an electric current or voltage could be varied in proportion to instantaneous gas pressures in the engine cylinder.—*Central-Station Mechanical Engineer.*

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Secretary of War Again Heads Federal Power Commission

FOLLOWING the precedent established by President Wilson, the Secretary of War has been designated by President Harding as chairman of the Federal Power Commission. If will be remembered that Secretary of War Baker was chairman of the first Federal Power Commission.

According to the terms of the water-power act the commission is to be composed of the Secretaries of War, the Interior and Agriculture. The new commission therefore is made up of Secretary of War Weeks, Secretary of the Interior Fall and Secretary of Agriculture Wallace.

Owing to the pressure of other important matters, the first meeting of the new Federal Power Commission was not held March 14, as scheduled.

Western Companies Offer $9,000,000 in Bonds for New Financing

TWO new issues of bonds, one of $7,000,000 in 7 per cent unifying and refunding mortgage bonds of the San Joaquin Light & Power Corporation, the other of $2,000,000 by the California-Oregon Power Company of first and refunding mortgage twenty-year 7½ per cent series gold bonds, came on the market this week. The former issue includes $2,000,000 serial bonds, maturing in equal amounts annually for five years, the remaining $5,000,000 becoming due in 1951. The proceeds of the serial bonds are to be used to refund $2,000,000 of debentures, and the proceeds of the 1951 maturities are to be used to refund floating debts and to reimburse the treasury of the company for the construction of additional transmission and distribution lines. The serial bonds are being sold to yield from 7½ to 8 per cent, according to the maturity, and the bonds maturing in 1951 are being sold at 7.2 per cent. The California-Oregon Power issue, which is due in 1941, is being sold on a 7½ per cent basis.

Daylight Saving Situation Not Uniform in the East

DAYLIGHT saving will be adopted again this year by many sections in Eastern and New England states. Present indications are, however, that there is going to be considerable confusion. New York has passed a bill repealing state-wide daylight saving, but leaving it optional with the local community whether it shall run on daylight saving or standard time. New York City will go on a five-month daylight schedule on the last Sunday in April. A bill is pending in the New Jersey Legislature to make the daylight schedule effective from April to September inclusive. The Pennsylvania Legislature defeated a measure providing that clocks be turned forward an hour the second Sunday in April and back on the second Sunday in September. This means that Pennsylvania will have standard time, as was the case last year.

In New Hampshire the Governor gave his approval and formal effect to a bill making standard time obligatory in that state. A similar bill passed the Connecticut Legislature this week. Massachusetts and Rhode Island will both go on the daylight-saving schedule.

It seems doubtful, in view of the action already taken by some states, that there can be a uniform time adopted throughout the East, and under the present arrangements perplexing conditions seem likely to prevail in the states of that section.

Electrical Industry Benefits But Slightly from Acts of Last Congress

NO LEGISLATION of which the electrical industry was the chief beneficiary was enacted by the third session of the Sixty-sixth Congress, which adjourned *sine die* March 4. This excepts the regular appropriation bills, a number of which provide for research and other activities of electrical interest. The electrical industry is expected to benefit materially from the action of the session in rehabilitating the War Finance Corporation, as well as a dozen other industries.

The legislation in which the electrical industry was interested most failed. The bill authorizing the Federal Power Commission to hire its own personnel, which would have made it an active and really independent agency, as well as paving the way for appropriations commensurate with the importance of its work, did not become a law. Legislation looking to the continuance of development work on the power project at Muscle Shoals was defeated. Closely linked with this latter was the United States Fixed Nitrogen Corporation bill, which passed the Senate but was pigeonholed by the House committee on military affairs.

The electrical industry was much interested in the Patent Office bill. That measure, after having been agreed to in conference, failed when the Senate refused to approve the conference report because it contained a section authorizing the Federal Trade Commission to administer patents granted government employees. The bill provided for the reorganization of the Patent Office and granted material increases in salaries. The electrical industry was particularly interested in seeing that portion of the bill become a law, but many electrical interests were opposed to any special favors in the handling of government employee patents.

An amendment to the water-power act exempting from its provisions lands within the national parks was adopted, but an effort to make the amendment apply to areas which in the future might be added to the parks was unsuccessful.

Among the measures which failed were the so-called packer and Calder bills. This legislation proposed

regulation of the packing industry and the coal trade respectively. The course of these two measures was watched closely by business generally, since their enactment would have established precedents in the regulation of private enterprise.

William McClellan Receives Nomination for A. I. E. E. Presidency

THE board of directors of the American Institute of Electrical Engineers upon receipt on March 11 of the report of the committee of tellers on its canvass of the nomination ballots cast for candidates for the Institute offices selected its list of "directors' nominees" as follows:

WILIAM M'CLELLAN

For president—William McClellan, Philadelphia.

For vice-presidents—W. A. Hall, Boston; N. W. Storer, Pittsburgh; W. A. Del Mar, Yonkers, N. Y.; C. G. Adsit, Atlanta; J. C. Parker, Ann Arbor, Mich.; F. W. Springer, Minneapolis; H. W. Eales, St. Louis; Robert Sibley, San Francisco; O. B. Coldwell, Portland, Ore.; F. R. Ewart, Toronto.

For managers—A. G. Pierce, Pittsburgh; R. B. Williamson, Milwaukee; Harlan A. Pratt, New York.

For treasurer—George A. Hamilton, Elizabeth, N. J.

The ballots will be mailed to the membership prior to April 1.

Utility Securities Gaining in Investment Strength

THE assertion that public utility securities were at last coming into their own in the eyes of the conservative investor was made by Charles Monroe, vice-president of the People's Gas Light & Coke Company, Chicago, in a talk on "Utility Securities from the Owner's Standpoint," before the Electric Club of Chicago on March 8. Mr. Monroe made the point that the danger of political attack from which the utility had suffered formerly had been largely removed by reasonable commission regulation and the fact that ownership of utilities had become so widely distributed among men of small means, all of them voters anxious to protect their interests against demagogues. Utilities, he continued, after six years of strenuous fight against high prices of material, fuel and labor, had reached a point where costs would go down and profits would go up correspondingly.

New York Edison Company Announces Specialized Exhibit Plan

A POLICY of specialized exhibits has been inaugurated by the New York Edison Company. This company does no merchandising but maintains showrooms where the public can see various electrical devices. At its largest showroom, at Irving Place and Fifteenth Street, the company now is planning monthly special exhibits at which some one line will be emphasized each time.

This plan was tried out last month with an electric vehicle show. April 4 to 15 will be given over to the display of electrical refrigerating equipment. It will be followed by an exhibition of electric signs in May, and in June industrial heating apparatus will be shown. There will be no special displays during the summer, but in November there will be a display of lighting fixtures and methods and in December electrical household equipment will be featured.

All manufacturers are invited to exhibit without charge. No admission is charged to the public, and in promoting the electric vehicle show the New York Edison Company even paid for the advertising.

Electric Vehicle Show for New Jersey Public Service

ANNOUNCEMENT is made this week that the showrooms of the Public Service Electric Company, Newark, N. J., will be given over from April 9 to April 16 inclusive to an electric vehicle show. Like the show held by the New York Edison Company in February, the Newark show will be held without expense to exhibitors or charge to the public. The show will include all classes of electric vehicles and accessories.

Following is a list of the exhibitors:

Commercial trucks—Commercial Truck Company, Oneida Truck Company, Walker Vehicle Company, Ward Vehicle Company.

Passenger cars—Rauch & Lang.

Industrial trucks—Automatic Transportation Company, Baker R & L Company, Crescent Truck Company, Hoagland-Thayer Company, Industrial Truck Company, Karry Lode Industrial Truck Company, Lakewood Engineering Company, Mercury Manufacturing Company, Terminal Engineering Company.

Battery manufacturers—Edison Storage Battery Company, Electric Storage Battery Company, General Lead Battery Company, Philadelphia Storage Battery Company.

Charging apparatus and accessories—Auto Electric Devices Company, Cutler-Hammer Manufacturing Company, Westinghouse Electric & Manufacturing Company, L. Bamberger & Company.

Arizona Votes Funds to Aid Colorado River Commission

THE Arizona Legislature has voted $25,000 as its share of the fund for the Colorado River Commission which will investigate and control the development of the Colorado River for power and irrigation purposes. Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming, as noted in the ELECTRICAL WORLD for Jan. 29, page 277, are to be represented on the commission.

It is thought that the commission will be of considerable influence in stimulating the development of power from this river, which will be of importance to the Southwest a few years from now. At the present rate of increase in power load in that territory most of the other easily available sites will have been developed and recourse must be had to the millions of horsepower available from the Colorado. The Southern California Edison Company has filed preliminary application with the Federal Water Power Commission for the development of the Colorado totaling more than 2,500,000 hp. The city of Los Angeles is also working on plans to develop power on this river. Action on the Edison company's permit has been suspended in order that a more general investigation of the river's possibilities may be made.

Much Optimism Expressed at Annual Meeting of Electrical Manufacturers

ATTENDANCE at the sixth annual meeting of the Associated Manufacturers of Electrical Supplies, held at the Hotel Biltmore in New York on Tuesday of this week, was the largest seen at any annual meeting of the association since its organization in 1915. In reviewing the status of the electrical manufacturing business for the fiscal year just closing President J. F. Kerlin pointed out that during that period conditions heretofore unknown to the industry had developed. The first six months had found every member of the association forcing the production of his plant to the utmost, while during the last half of the year in many cases the rush of orders was held up completely.

PRESIDENT J. F. KERLIN

"The pendulum of prosperity," said Mr. Kerlin, "apparently went too far, struck something and came back with a terrific rebound. It is still quivering and somewhat unsteady from the shock, but is now gathering momentum for another forward swing which is just as sure to come as day follows night. Contrary to the popular belief, there was no inflated bubble in our business. It was simply a legitimate expansion forced into high speed by the unprecedented and universal call for help upon man's most marvelous co-worker—electric power. This demand was temporarily met but not satisfied, and if the logic of events continues to repeat, we can look forward with the assurance that our present expanded capacity will be altogether inadequate."

Better Public Good Will

His opinion, Mr. Kerlin stated, was based entirely upon actual and available figures, and he called attention to the greatly increased demand for electric service brought about by the exigencies of war conditions and consequent reconstruction. People who had regarded electricity as a luxury now think of its practicability, safety and comfort, and they constitute a potential purchasing power difficult to estimate. Referring to the attitude of the public toward the utility companies, which has an important bearing upon the whole industry, he said:

"The people of this country are learning the facts about the electric public utilities, with the result that their attitude is constructive rather than destructive, and the government—federal, state and municipal—is extending to them the hand of needed encouragement."

Further grounds for optimism were found by Mr. Kerlin in the achievements of the manufacturers' association, which included the elimination of waste by standardizations, development of a cost system and simplification of many devices and their adaptation to common usage. Co-operation with other bodies has carried the matter of safety to a point consistent with regulation and public satisfaction. Through discussion the association has learned more about the raw materials used in its products, and a uniformly increased quality has resulted. Furthermore, the association has improved its merchandising methods, solved many traffic problems and increased the efficiency of its credit systems, all of which enter into the primary cost of the product.

Standardization and Cost Co-operation Desirable

Concluding his review of existing conditions and the work of the association, Mr. Kerlin said: "With these and many other advantages we approach the enforced, new order of business, with full confidence in our ability to render a valuable service that is bound to bring commensurate reward. Notwithstanding the accomplishments of the past, there is still much work to be done. A more universal standardization along lines now under way, and closer co-operation in the matter of costs, will be found desirable, if not necessary, in order that our members may keep fully abreast the rapid changes in economic conditions. The association should continue its intimate connection with the various associations and committees with which it is now affiliated with a view to concentration of effort or perhaps a consolidation of some organizations which will eliminate to some extent this apparent duplication."

That the association has changed but little since its organization was emphasized by Charles E. Dustin, general secretary, in his report for the past year. Mr. Dustin thought that this seemed the best indication that the lines upon which the association was formed were correct. Much has been accomplished by the association, he said, in compiling records of production and costs and submitting these to members in the form of comparisons. From these comparisons differences of as much as 25 per cent to 40 per cent were discovered, indicating the urgent need of uniform cost accounting.

H. R. Sargent in presenting his report of the activities of the association's representative to the National Fire Protection Association said that it had been proposed that the National Electrical Code be adopted by the American Engineering Standards Committee. However, as such adoption would allow of revision of the code only once every three years, it was not thought desirable at this time.

In connection with the revision of the code Mr. Sargent stated that a simplified code recently brought out by Portland, Ore., had many advantages over the present code in its clarity and ease of application. A committee will be appointed by the association with a view to modifying the code to correspond to that of Portland.

Tariff

In reporting the work of the tariff committee, William Burgess brought out the fact that few electrical manufacturers were aware of the protection they have been receiving, because the present tariff does not cover electrical apparatus by name. Electrical products have been classified under the metals schedule, which up to 1914 had a protection of 45 per cent. Passage of the Underwood bill at that time reduced this to 20 per cent. During and since the war imports were virtually nil, but renewed importation of foreign-made electrical apparatus may be expected at any time, and this, under the reduced tariff and depreciated values of foreign money, would seriously handicap American manufacturers.

At this time the ways and means committee in Washington is working on a revision of the tariff for better

protection of American manufacturers. With this end in view it is proposed to assess tariff payments on the value in the United States instead of the value in the country of origin. This would have the effect of placing on German-made goods a duty of about 25 per cent, instead of only 7 per cent if assessment were made on the basis of value in Germany in marks.

Upon completion of Mr. Burgess's report the following resolution was adopted and sent to President Harding and also Senator Penrose and Representative Fordney of the ways and means committee in Washington: "Resolved, that this meeting approves the proposition that tariff payments shall be assessed in United States values instead of the value in the country of origin."

Thomas M. De Bevoise, general counsel of the association, said that the Lockwood investigating committee of the New York Legislature had called for certain records and files of the association's transactions. This, however, in Mr. De Bevoise's opinion, was a mere matter of routine on the part of the Lockwood committee as the affairs of the association have been so conducted as to avoid any cause for suspicion on the part of such a committee.

ELECTIONS

To take the places of members of the board of governors whose terms had expired by limitation the following were proposed and elected: S. H. Blake, General Electric Company, Schenectady, N. Y.; A. H. Englund, Electric Service Supplies Company, Philadelphia; F. L. Bishop, Hartford Faience Company, Hartford, Conn.; A. F. Hills, Crouse-Hinds Company, Syracuse, N. Y.; Robert Kuhn, American Electrical Heater Company, Detroit.

The following officers also were elected for the ensuing year: President, Shiras Morris, Hart & Hegeman Manufacturing Company, Hartford, Conn.; vice-president, W. H. Thornley, Tubular Woven Fabric Company, Pawtucket, R. I.; treasurer, J. W. Pery, Johns-Manville Company, New York, and general secretary, Charles E. Dustin, New York.

By a rising vote of all members present suitable resolutions were adopted expressing sorrow at the death on Feb. 18 last of Edward B. Hatch of Hartford, Conn., a charter member of the organization and a member of the board of governors.

Atlantic Jobbers Get Together to Discuss Current Business Conditions

REGARDING the subject of prices and stocks as a good rallying point in any present-day discussion, the Atlantic Division of the Electrical Supply Jobbers' Association opened its session in the Hotel Commodore, New York City, on March 15, with the topic, "Necessity for Maintaining Stocks for Service Under All Conditions," led by W. I. Bickford, Iron City Electric Company, Pittsburgh. That stocks should be kept in a balanced condition under any conditions of business was the main thought expressed by Mr. Bickford, but both his remarks and those of other jobbers and of manufacturers who took up the discussion bore strongly on the question of price reductions and buying.

Charles L. Eidlitz, president of the R. B. Corey Company, New York City, gave some very entertaining and enlightening figures and ideas in presenting, with the use of charts, "How to Sell the Contractor." With figures on costs of electrical work on four large wiring jobs in New York City, he showed that almost the entire cost of electrical material entering into those jobs was covered in mechanical, current-transmitting and contact-making-and-breaking materials. Consequently most of the attention of jobbers' salesmen could profitably be concentrated on sales of these classes of material.

A report on systems employed in receiving, shipping and charging departments was presented by E. Donald Tolles, secretary of the division, showing the results of a detailed study of record keeping.

Part of the afternoon was given over to a message from the Society for Electrical Development, brought by W. L. Goodwin, assistant to the president. Mr. Goodwin appealed for greater support of the society by all branches of the industry. He showed representation of approximately 25 per cent of the jobbers, 10 per cent of the manufacturers and 20 per cent of the contractors. The central station was well represented.

At the executive session Fred E. Stow, secretary and general manager of the H. C. Roberts Electric Supply Company, Philadelphia, was elected chairman of the division to fill out the unexpired term of A. M. Little till July 1, 1921.

Recommends Private Development of New York Water Powers

GOVERNOR MILLER appeared last week before the Legislature of the State of New York with his long-expected water-power message, in which he recommends regulated private development of the state's water power resources rather than state and municipal development, as was proposed last year. Water-power development is urged because of the revenue to be derived from the resulting taxes and because of the benefits that will come from resulting cheaper power.

To insure development of the state's waters the Governor recommends the passage of a licensing act along the general lines of the federal water-power act. It is recommended that licenses be granted only for projects which provide for the maximum development of a given stream, watershed or territory.

The first step, as the Governor sees it, in the development of the water powers of the state is "the adoption of a policy which will make it practicable for private initiative to undertake the task under safeguards which will protect the public interest." It is recommended that power purposes be included as one of the uses to which state lands within forest preserves may be put.

The Governor in his message hinted at a state-wide transmission project, saying:

"Undoubtedly maximum use and economy of hydro-electric power will result only from some common method of transmission by which the widest distribution may be secured, and thus the variable factor both of use and development ameliorated as much as possible. Steam and hydro-electric power must supplement each other, and it is undoubtedly true that tremendous economies would result if all power could be converted into electrical energy and by a common transmission system made to serve all users within a given zone. If the potential energy of coal and water could be utilized in common by the most economical generation of each and a common distribution of both, true conservation of energy would result."

Metermen Plan "Get-Together" Meeting at N. E. L. A. Convention

PLANS are now under way and the details will be announced later for a metermen's "get-together" dinner at the N. E. L. A. convention in Chicago, May 31 to June 3. It is proposed to discuss at this time the report of the meter committee and to find out in what way this committee can better co-operate with the metermen.

Vermont Electrical Association to Meet March 24

THE Vermont Electrical Association will hold its annual meeting at the Hotel Vermont, Burlington, Vt., on March 24. A business meeting will be held at 3 p.m., with a banquet in the evening. On the same date and at the same place the accident prevention committee of the New England Division, N. E. L. A., will hold a meeting. A. B. Marsden, Rutland, Vt., is secretary of the Vermont association.

Security Sales, Fuel and Other Themes Interest Illinois Utility Men

THE change in the status of public utility securities wrought in the last eighteen months as a result of the shift from the great industrial profits due to war conditions to the losses of more recent months was the theme of John F. Gilchrist's address at Chicago this week before the joint session of the electric, gas and railway associations of Illinois. The vice-president of the Commonwealth Edison Company dwelt on the education of investors during the last few years to put their savings into sound securities and to buy on the partial-payment plan. Utility securities, founded on the rock of human needs, are second only to government securities, Mr. Gilchrist continued, and with the growing public confidence it is the easy and logical thing to utilize the personnel of the utility organization as a sales force to dispose of securities. The ease with which several stock issues have been recently disposed of in Illinois was cited, and the speaker explained the saving in brokerage fees of 15 or 20 per cent that this plan makes possible. The employees selling these issues have as a rule been paid a fee of 2 or 3 per cent.

The Illinois State Electric Association session on Tuesday afternoon listened to a discussion on central-station merchandise service and its possibilities by D. W. Snyder of Bloomington, in which Mr. Snyder outlined his company's policy of not doing house wiring where there are dealers able to do this work, of handling only meritorious appliances, of co-operation with local dealers and the conduct of its merchandising department in such a way as to increase electric energy sales, popularize the use of electricity and better the service of the community. J. G. Learned of the Public Service Company of Northern Illinois pointed out the opportunity of bettering public relations through proper merchandising and outlined a new plan of training saleswomen to call at homes and put appliances already in possession of the consumer in usable condition. No charge for repairs that can be made with a screwdriver is made, and the women give suggestions for the better use of appliances. Mr. Snyder, in discussion, said that in some small towns the net revenue from appliance sales was as much as 50 per cent of the net revenue from light and power, while it was approximately 10 per cent of that of the system as a whole.

J. H. Thomas of Peoria presented customer accounting from the standpoint of machine billing, and in the discussion that followed H. E. Addenbrooke of Chicago emphasized the importance of the one-line bill as an efficiency measure.

On Wednesday W. L. Abbott discussed "The Consumers' Stewardship of the Coal Deposits." After outlining the waste due to improper mining methods and the high costs due to the irregular nature of the business as now conducted, Mr. Abbott suggested that waste due to improper mining methods might be eliminated by giving a bounty on all coal mined clean—that is, with none left in the area mined.

Isolated Plant vs. Central Station

The Wednesday afternoon session was devoted to the discussion of isolated-plant as against central-station service under present conditions, the hazards of faulty switchboard construction and the testing of instrument transformers. John H. Mitchell of East St. Louis pointed out the inefficiency of the average isolated plant, asserting that there are many more turning out a kilowatt-hour on 8 lb. of coal than there are turning one out on 2 lb. and that the majority of isolated plants of less than 1,000 kw. rating are running in excess of 8 lb. That the industrial managers of the country are boosters for central-station service was maintained, but the service must be sold not merely for today but for years to come and to the real advantage of the purchaser. R. M. Bert of Rockford discussed the hazards of faulty switchboard construction, illustrating his remarks with some examples of severe troubles due to switches of inadequate rupturing capacity and pointing out the danger of attempting to fight fires on switchboards without shutting down the plant.

In discussing the work of the National Electric Light Association President Insull announced that a long stride toward co-operation with the American Telegraph & Telephone Company in solving the inductive-interference problem had been made.

The morning session on Wednesday concluded with the adoption of a joint resolution pledging the aid of the Illinois public utilities in the renewal of building construction by making all needed extensions.

Electrical Leaders Address New England Jobbers

CO-OPERATION between the various branches of the electrical industry was informally discussed before the New England Electrical Supply Jobbers' Club at Boston, March 14, by William Goodwin, assistant to the president of the Society for Electrical Development; C. L. Edgar, president of the Edison Electric Illuminating Company of Boston; Bowen Tufts, president New England Division N. E. L. A.; M. F. Falk, chairman Rhode Island Electrical League; William Gould, chairman New England Electrical Sales Associates, Boston; A. J. Hixon and George B. Quimby, Boston; C. B. Burleigh, General Electric Company, Boston; George H. Cox, manager Westinghouse Electric & Manufacturing Company, Boston; C. R. Hayes, engineering manager Charles H. Tenney & Company, Boston, and Frank S. Price, president Pettingell-Andrews Company, Boston. W. F. Abely, assistant manager Western Electric Company, Boston, presided.

Senate Confirms President's Nominations for District Commissioners

PRESIDENT HARDING has nominated and the Senate has confirmed Cuno Rudolph and Capt. James F. Oyster to be commissioners for the District of Columbia. Objection was voiced to each of the nominees on the ground that they were interested in public utilities. At a hearing before the District committee of the Senate it developed that neither of the nominees has any financial interest in Washington utilities. The inference was plain that those who appeared in opposition to the nominees fear that the new commissioners will be too friendly to the public utilities. That the opposition to the nominees made little impression was evident from the fact that the committee acted unanimously in recommending their confirmation.

Electric Service in Steel District to Be Topic of Joint Meeting

RECENT steps which have been taken by the Duquesne Light Company still further to assure the Pittsburgh steel district of adequate power and uninterrupted service will be the principal topic of discussion at the joint meeting of the American Institute of Electrical Engineers and the Association of Iron and Steel Electrical Engineers to be held in Pittsburgh on April 16. In the morning at 10 o'clock there will be an inspection trip to the new 300,000-kw. (ultimate capacity) Colfax station of the Duquesne company. Following luncheon at the station the visitors will return to the Chamber of Commerce, Pittsburgh, where the first technical session will be held. At this session, which will be under the auspices of the A. I. E. E. and will be presided over by President A. W. Berresford, a paper will be presented on "The Colfax Power Station of the Duquesne Light Company" by D. L. Galusha and C. W. E. Clarke of Dwight P. Robinson & Company, Inc.

At 6 p.m. an informal dinner will be served at the William Penn Hotel, followed by a technical session at 8 p.m. in the hotel. This session will be under the auspices of the A. I. & S. E. E. and will be presided over by President E. S. Jeffries. Two papers will be presented: "Problems of Conversion from 60 Cycles to 25 Cycles," by B. G. Lamme of the Westinghouse Electric & Manufacturing Company, and "Some Results in the Change from 60-Cycle to 25-Cycle Energy," by D. M. Petty, Bethlehem Steel Company.

Experiments Being Conducted to Popularize Radio Telephone

SOME interesting experiments having as their purpose the popularization of the wireless telephone are being conducted by the Westinghouse Electric & Manufacturing Company at East Pittsburgh, where it has installed a radio telephone station, from which a nightly program is given that can be heard within a radius of 1,800 miles. The evening concert consists of music such as phonograph selections, vaudeville from the Davis Theater and talented singers. On Sundays the entire church service of the Calvary Church is sent out broadcast and the church is thus virtually brought to the home. Radio amateurs with ordinary short-wave receiving sets can hear this station, and letters have been received from hundreds of operators as far distant as Warren, Ariz.; Denver, Col.; Ellendale, N. D.; Deland, Fla., and Montreal, Canada, saying that these concerts are enjoyed almost every night. One of the features of the nightly program is the answering of questions on wireless by means of the radio telephone. The latest news is sent out, and persons living in rural districts can thus receive news much sooner than would ordinarily be possible. When eminent men visit Pittsburgh their speeches are given to thousands by means of the radio telephone, instead of to only the few assembled in the banquet hall. Transmitters are concealed in flowers on the speakers' table and the words telephoned to East Pittsburgh, where they are broadcasted.

New Public Service Board for New Jersey Named

IN ACCORDANCE with the provisions of the new public utility bill of the State of New Jersey, recently passed over his veto, Governor Edwards has submitted to the State Senate the following names: Former Congressman Joseph A. Hammill, former Civil Service Commissioner Joseph S. Hoff, at present president of the National Bank of Princeton and the Princeton Savings Bank, and Harry Bachrach, former Mayor of Atlantic City and now president of the Marine Trust Company and director in several other mercantile institutions. The terms are for six, four and two years respectively.

The board of three members will succeed the old board of five members. Under the new law the power of removal is taken away from the Governor.

Massachusetts Utility Financing Explained at Boston Hearing

FREDERICK MANLEY IVES, general counsel for the Edison Electric Illuminating Company of Boston, appeared before Councilor Watson and others at the City Hall, Boston, on March 10, to explain pending legislation to enable Massachusetts electric utilities to capitalize premiums on stock issues. He pointed out that in the case of the Boston company its total capitalization, including premiums, now amounts to $40,447,000, the stock par value representing $22,528,000 and the premiums $17,919,000; an average of $179.54 has been paid in per share. Considerable popular misunderstanding exists, Mr. Ives said, regarding the intent of this legislation, which was recently outlined in the ELECTRICAL WORLD. Early stockholders, he maintained, deserve a higher yield on account of the greater risk that they took. The object is primarily to facilitate the raising of money for utility development, he pointed out, through the conversion of premiums into stock and the unification of shares at a reduced dividend rate. The speaker announced that the decreasing cost of coal will be reflected in bills rendered to consumers month by month as spring advances and showed that through easier financing the tendency is toward improved service and more favorable rates. The point was brought out that in 1919 the Edison company sought to have the price of street lighting arbitrated through joint petition with the Corporation Counsel of the City of Boston, but that no steps had been taken toward this readjustment of rates, necessitated by increased costs of service, for the reason that the city's representative preferred to negotiate for the new price and that up to date no agreement had been reached.

Waste Elimination Study Well Under Way

THE work of the committee on elimination of waste in industry is well under way, according to a statement this week by L. W. Wallace, secretary of the American Engineering Council of the Federated American Engineering Societies. Reports on the first investigation in each industry have been made. At a meeting of the planning board held on March 1 further reports were presented and plans made for continuing the investigations more intensively. In New York, New England and Pennsylvania the fuel investigation is virtually completed.

A small staff to plan and direct the work is to be maintained at headquarters. The field work is to be done by engineering firms carefully selected for their fitness so that the committee will obtain the benefit of the experience and knowledge of that firm that has had most intimate contact with a given industry. The firms are doing the work at actual cost to them. Ten industries because of their general importance and interest to the public have been selected for study. They are (1) bituminous coal, (2) building trade, (3) transportation, (4) men's ready-made clothing, (5) printing, (6) paper, (7) metal trades, (8) textiles, (9) shoes and (10) rubber.

From three to ten plants of each selected industry are being visited by an experienced engineer, who will get the information desired by the committee. A carefully prepared list of questions has been placed in the hands of each field worker. The information obtained by the field investigator is being supplemented by such authoritative data as may now exist in the form of reports made by reliable parties or agencies. Through this means information is to be obtained to enable the committee to formulate specific conclusions as to the major causes of industrial waste.

To accomplish the purposes of the committee it has been found necessary to make studies along the following lines:

First—Organization, which assigns responsibilities and relationships and concerns the discharge of such functions.

Second—Engineering, which comprises the design, construction and maintenance of plant, machinery and tools and the design of the product.

Third—Production control and cost control. Under this division fall all the factors relating directly to production and its proper direction and accounting.

Fourth—Physical factors. This division relates to the storage and inspection of raw and processed materials and to matters of internal transportation. It also includes consideration of the physical condition of the plant as regards lighting, heating, toilet facilities, etc.

The first and third sections, as well as a major part of the fourth, directly relate to the human element in industry. The committee is devoting the major portion of its effort to the factors that affect the human element. The important subdivisions of the major factors, organization, production and cost control, and the physical factors to which special attention is directed by the committee follow:

ORGANIZATION

(a) Nature of operation: (1) Contractual—This form presents many problems that affect personal relations; building operations are largely contractual; this form of relationship is quite common in the clothing industry. (2) Repetitive—A large portion of the industrial activity is repetitive; this phase of industry makes prominent the question of monotony and occupational diseases. (3) Continuous—Steel and chemical industries are typical representatives. In this form of operation the question of the number of shifts is considered important.

(b) Types: The type of organization is some index to the quality of the management and as such is an essential consideration—(1) functional, (2) line and staff, (3) staff, (4) mixed, (5) committee.

(c) Personal relations: (1) Employment policies. (2) Representation—to what extent each plan has been tried and with what results—(a) federal plan, (b) joint committee, (c) employees' co-operative associations. (3) Strikes and lockouts—the case for the duration of, the man, hours lost, and the total cost. (4) Restrictions by management and labor—an investigation of the means employed by management and by labor to restrict production; such practice produces an unstable condition and hence leads to uncertain labor conditions and disturbed relations. (5) Unemployment—(a) quantity of, (b) causes of, (c) remedy for. (6) Seasonal and intermittent employment—(a) quantity of, (b) causes for, (c) remedy of.

PRODUCTION CONTROL AND COST CONTROL

(a) Planning: All of these factors have a direct influence upon the productivity of the individual worker. If inadequately or ineffectively provided for, the worker loses time and compensation, and hence a high morale is not sustained.

(b) Establishing standards: This is very significant, as many labor disputes have arisen over the method and fairness used in establishing such standards. They have a direct bearing upon the earnings of the worker.

(c) Maintenance: If equipment is not properly maintained, the operator does not accomplish standard tasks, hence dissatisfaction results.

State Legislature Subpœnas Public Utility Heads

THE fight that has been going on in California for the past two months between the state government and the heads of the various corporations of the state over the proposed King bill, which proposes to increase the taxes of corporations, has taken on a different aspect. The bill was passed March 5, but an opportunity is to be given various corporation heads who have been making statements in the press to show how from $8,000,000 to $11,000,000 can be cut from the budget without impairing the efficiency of the government. Senator W. J. Carr, head of the budget investigating committee, has prepared a list of subpœnas for these corporation heads to make them appear before the budget investigating committee and show where this money can be saved. Among the men subpœnaed are Wiggington E. Creed, president Pacific Gas & Electric Company; Herbert W. Clark, counsel San Francisco-Oakland Terminal Railways; B. C. Carroll, general agent Pacific Telephone & Telegraph Company; Frank Karr, chief counsel Pacific Electric Railway Company; Champ E. Vante, vice-president Los Angeles Gas & Electric Corporation; W. R. Alberger, vice-president and general manager San Francisco-Oakland Terminal Railways; Mortimer Fleishhacker, president Anglo-California Trust Company; William Sproule, president Southern Pacific Company; R. H. Ballard, vice-president Southern California Edison Company; William Clayton, vice-president San Diego Electric Railway, and Max Thelen, attorney representing the corporations, who was formerly president of the California State Railroad Commission. The new law increases the tax rates of utilities about one-third.

Electrification Plans in Italy

A REPORT from Rome is to the effect that a special department has been established in the Ministry of Public Works for the purpose of studying thoroughly all possibilities for the utilization of water power in the country. Up to the present time only two-fifths of all available water power has been exploited for industrial purposes. The government has now appropriated 800,000,000 lire (about $160,000,000 at the old rate of exchange) in order to extend the electrification all over the country. It is said that by taking these steps about 2,000,000 tons of coal will be saved every year. Besides supplying energy to the Italian industries it is intended to begin as soon as possible the electrification of the railroads, attention being given in the first place to the lines from Rome to Turin and from Rome to Nettuno.

Society for Promotion of Engineering Education Forms N. E. Section

GARDNER C. ANTHONY, dean of the Tufts Engineering School, was elected chairman and H. S. Boardman, dean of the University of Maine Engineering School, was made secretary of a New England section of the Society for the Promotion of Engineering Education on March 12, at a meeting for organization held at the Worcester (Mass.) Polytechnic Institute. President Ira N. Hollis of the institute welcomed about fifty engineering educators to Worcester, and during the day addresses or discussions were contributed by Dean M. E. Cooley of the Engineering School, University of Michigan, and president of the society; Prof. Charles F. Scott of Yale University, Dean Anthony, Dean H. J. Hughes of the Harvard Engineering School, Prof. Dugald C. Jackson of the Massachusetts Institute of Technology, Principal A. L. Williston of the Wentworth Institute, Boston; Prof. W. S. Franklin, Massachusetts Institute of Technology; Profs. C. M Allen, A. L. Smith and W. W. Bird, Worcester Polytechnic Institute, and others. Preliminary plans were reviewed for the national convention of the society at New Haven, Conn., in June. Emphasis during the discussions was laid upon the importance of broad training for engineers, upon separating the school training of artisans and foremen from that given to candidates for professional engineering degrees, upon the need of less fragmentary textbooks and the importance of human interest to instructors.

Wireless Fog Signals to Protect Navigation

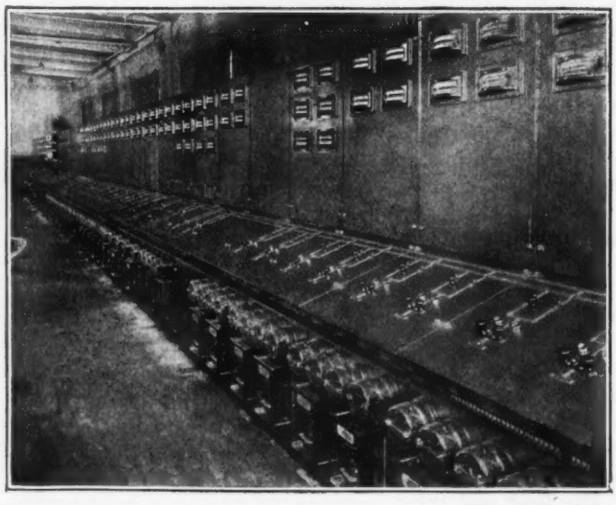
ANNOUNCEMENT was made this week by Secretary of Commerce Hoover that because of the important development of a radio compass by the Bureau of Standards three wireless fog signals would be immediately installed at the entrance to New York Harbor through the Lighthouse Service. Each of these three stations is equipped with an automatic radio set sending out signals continuously during fog or thick weather. They may be picked up on shipboard by means of the new radio compass which indicates the direction from which the radio signals are sent out, and by taking observations on the different stations the captain of a vessel may determine his exact position without being obliged to rely on the former unsatisfactory method of locating himself by the sound of whistles and foghorns. The Lighthouse Service plans to establish other stations as rapidly as necessary funds are provided.

These signals have been developed as the result of co-operative experiments by the Bureau of Standards and the Lighthouse Service, and more especially through the research work of the Bureau of Standards in improving the radio compass. The system differs from other systems in use for determining radio direction in that the navigator himself can determine radio bearings just as he uses his magnetic compass for bearings in clear weather and does not have to depend upon expert radio operators.

Would Legislate Against Compulsory Customer Financing in New York

AN AMENDMENT to the penal provisions of the public service law of New York State has been introduced into the Legislature which makes it a misdemeanor "for a public service corporation, its agents or employees, to solicit, exact or receive any subscription to its capital stock, or any purchase of its bonds, notes or other evidence of indebtedness, as a consideration or inducement for furnishing its service, or for constructing, extending or supplying structures, equipment, instrumentalities or other means for furnishing such service; and providing that such service shall not be withheld, diminished or delayed because of the failure or refusal of any person to subscribe to such stock or to purchase such bonds, notes or other evidence of indebtedness."

Switchboard of Record Size Shipped to South Africa



WHAT is said to be the largest switchboard ever built was recently shipped to Capetown, South Africa, by the General Electric Company to be installed in the new municipal Dock Road power house. It is designed for an ultimate capacity of 20,000 kva., the actual capacity at the present time being 11,500 kva. The board, which is of the bench type, is 101 ft. 6 in. long, 90 in. high over all and 6 ft. 5 in. from the back to the front of the sub-base sections. It has forty-seven sections, is entirely equipped with standard apparatus and also has some special features which are made necessary by the installation. To give an idea of the magnitude of the board there are 145 horizontal flush-type meters, 180 relays of various types, 161 current transformers, 126 indicating lamps, 27 potential transformers and 33 watt-hour meters.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Final Hearing on St. Lawrence Project. — Final arguments for or against the proposed St. Lawrence River navigation and power development are to be heard by the international joint commission in the Federal Building at Detroit on Wednesday, March 30.

Central Maine Power Company Enlargement Probable.—The Maine Public Utilities Commission has authorized the Central Maine Power Company to take over the property and franchises of eight smaller companies—the Hartland, Newport, Union, Waldoboro, Wiscassett, Penobscot Bay, Solon and Bath & Brunswick.

Hydro-Electricity on the Tippecanoe. —Work is expected to begin this spring on dams along the Tippecanoe River intended to promote the development of electricity for several of the larger towns in northern Indiana under the auspices of a three-million-dollar corporation to be known as the Tippecanoe Power Company. Seven units of 20,000 hp. each are planned.

New York Electric Rates Cut by Injunction.—The city of New York has obtained an injunction from the Supreme Court restraining the New York Edison Company and the United Electric Light & Power Company from continuing to charge consumers of electricity a rate higher than that fixed by the Public Service Commission in July, 1917. This official rate was fixed on a sliding scale, and the maximum charge was 7 cents per kilowatt-hour. The immediate result of the decision is to reduce the rate from 7.9 cents per kilowatt-hour to 7 cents. The matter will be settled upon trial.

Mexican Power Projects.—It is announced that plans have been adopted by the Dolores Mines Company, an American corporation, to construct a large electric power plant at Madera, in the Mexican State of Chihuahua, and to build an ore-reduction mill at Dolores, in the same state. In the Guanajuato district important improvements and additions are, it is reported, to be made to the hydro-electric plants and power-transmission system of the Guanajuato Light & Power Company, which supplies electrical energy to mines and industries in the states of Guanajuato and Jalisco. A scheme said to have the approval of the government engineers is reported from Santa Rosalia. According to the announcement, the water which passes through the turbines of the large hydro-electric plant at Boquillas, Chihuahua, is to be used for irrigating 200,000 acres of land in the valley of the Conchos River.

Measuring the Human Emotions by Electricity.—A novel field for electricity was described recently before the Royal Institution of Great Britain by Prof. A. D. Walker, who explained how the electrical art can be of assistance to psychologists in studies of a biological nature. The method is that of measuring by means of a Wheatstone bridge the changes in blood pressure which result from the response of the human brain to emotional indications. The subject for study is used as one arm of the Wheatstone bridge, through which a constant current is passed, any change in blood pressure being recorded on a galvanometer. According to the London *Electrician* Professor Walker said that he was not as yet prepared with any explanatory theory of the phenomena that take place. He suggested that the method might serve in the detection of malingering and the exposure of spiritualistic frauds.

Purdue Experiments with Electricity in Floriculture.—The agricultural experiment station at Purdue University has announced results from recent tests which may prove of great value to florists and flower raisers generally. The experiment consisted in using electric lamps during cloudy weather to prevent "bud drop," sweet-pea plants being selected as those on which to make the trial. It had been found, according to R. D. Brown, who had charge of the work, that the buds began to drop Jan. 24 during a period of dark weather and they continued to drop during the cloudy period until Feb. 8, when a 100-watt lamp was placed above the twelve plants used in the experiment. Twelve flowers were picked from these plants on Feb. 10. On Feb. 13 five out of the twelve buds had a full blossom, while none of the buds without the artificial light had developed any color. Further experiments are to be conducted.

Tidal Power Plant at East Saugus, Mass.—This undertaking, which is being promoted by the Universal Tide Power Company, as described on page 507 in the Feb. 26 issue of the ELECTRICAL WORLD, has not received the indorsement of the Providence Engineering Society, which investigated it with the idea of protecting local investors. After a thorough investigation the society concluded (1) that the project now under construction will not develop sufficient power to demonstrate the efficiency of the machinery, (2) that the claims with respect to contemplated plants cannot be met, (3) that the proposed method of converting water power into electrical power is very inefficient and not so practicable as with modern and efficient low-head waterwheels, (4) that the two-basin method of developing power has been tried out thoroughly by experienced engineers and has not yet proved a success, and (5) that the probability of the Universal Tide Power Company's ability to pay dividends on the investment is very remote, and therefore "we do not think it would be advisable for any one to invest his money in this firm."

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

An Engineers' Club for London.—Strong support for a proposed Engineers' Club in London is being received, and a representative provisional committee has been appointed. L. B. Atkinson, president of the Institution of Electrical Engineers, and other well-known electrical men are members of this committee.

Atlanta Engineers Meet.—A "get-together" meeting of the various engineering societies of Atlanta, with the local members of the A. I. E. E. as guests, was held on Feb. 25. Following out the study of the Atlanta Section, A. I. E. E., on Superpower Zone work, Charles G. Adsit, consulting engineer of the Georgia Railway & Power Company, addressed the meeting on "Rainfall on the Southeastern and Western Slopes of the Appalachian Range," giving facts which materially aided the Superpower Zone committee in its work.

Section Meetings, A. I. E. E.—At a meeting of the Detroit-Ann Arbor Section, A. I. E. E., last night (March 18), B. G. Lamme told "The Story of the Induction Motor." The Kansas City Section will meet on March 25, when H. C. Blackwell, general manager Kansas City Light & Power Company, will describe that company's plant. The San Francisco Section also will meet on March 25, when J. E. Woodbridge, resident engineer for Ford, Bacon & Davis, will discuss "A Variable-Voltage Railway Converter Substation." On April 1 J. Muirhead will speak on "High-Voltage Transmission in British Columbia" before the Vancouver (B. C.) Section.

Coming Meetings of Electrical and Other Technical Societies

Association of Iron and Steel Electrical Engineers—Birmingham Section, March 19; Pittsburgh Section, March 19; Chicago Section, March 22; Philadelphia Section, April 4; Cleveland Section, April 11.

Wisconsin Electrical Association—Milwaukee, March 23 and 24. (For program see issue of Feb. 19, page 448.)

A. I. E. E. (New York Section) and A. S. M. E. (Metropolitan Section) — New York, March 25.

A. I. E. E., Section Meetings—Kansas City March 25; San Francisco, March 25; Vancouver, B. C., April 1.

A. I. E. E. and A. I. and S. E. E.—Joint session, Pittsburgh, April 16.

Missouri Association of Public Utilities—Kansas City, April 21-23.

American Electrochemical Society—Atlantic City, April 21-23.

American Physical Society — Washington, April 23.

United States Chamber of Commerce—Atlantic City, April 27-29.

American Society of Civil Engineers—Houston, Tex., April 27.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Service Standards and Original Cost.—The Kansas Natural Gas Company having appealed from an order of the Kansas Court of Industrial Relations which denied increased rates and insisted on enlarged requirements of service, the United States District Court declared that neither the rule that plant efficiency must precede an increase in rates nor the rule that deferred maintenance must not be reflected in the rates holds good in all cases. The court held that to take original cost less theoretical accrued depreciation as a controlling basis of valuation for rate making would in the case before it be virtual confiscation. Cost of reproduction new, the court said, should not be rejected but carefully considered, together with the other elements, in reaching judgment. "The elements of depreciation," it added, "should not be measured by a theoretical yardstick, but should be determined by a careful consideration of the actual facts touching the physical condition of each particular plant under consideration."

Injury to Consumer from Shock While Using Electric Light Creates Presumption of Company's Negligence.—Affirming a judgment against the defendant in Lynch vs. Meyersdale Electric Light, Heat & Power Company, where damages were sought because of the death of plaintiff's husband from electric shock while handling a bulb attached to a cord, the Supreme Court of Pennsylvania held that with proper precautions on the part of the electric company the presumption is that no such injury will occur, and that therefore its actual occurrence creates a presumption of negligence against the company. Where the court charged that if defects in apparatus owned by the deceased caused his death the verdict should be for the defendant, the jury must be presumed to have determined that there were no such defects. Experts were properly permitted to base opinions on the testimony of witnesses who described the facts, and evidence that other persons who used the company's service had received shocks about the same time as the deceased was properly admitted, even where the premises in which such persons were said to have received shocks were not connected to the same transformer as the house where the fatality occured. (112 At. 58.)*

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Rules of Evidence in Commission Proceedings.—The public service company law of Pennsylvania did not contemplate that the strict rules of evidence should be applied to hearings before the Public Service Commission, and therefore, the Supreme Court of that state has held, in Schuylkill Railway Company vs. Pennsylvania Commission, the article in the law providing that the testimony taken should come up on appeal as a part of the record was no doubt intended to afford the courts an opportunity to see that there was some reasonable basis in the proofs for the decision of the commission, not that the courts might examine the testimony to see whether the strict rules had been complied with. (112 At. 5.)

Admissible Evidence in Suit for Damages Because of Fatal Accident.—Evidence as to the effects of electrical shock given by a witness who, though not a physician, had seen fatal electrical accidents, and evidence that another person than the deceased in the case on trial had subsequently to the death of the latter received a shock under similar circumstances, were both held admissible by the Supreme Court of California in Robinson vs. Western States Gas & Electric Company. In this suit damages were sought because of the death of a farmer while working with a windmill with the metal part of which, it was alleged, electric wires designed to convey power for its operation had, through the negligence of the company, come into contact. The company disputed the cause of death and offered evidence that the fatality was due to dilatation of the heart, but the court overruled this testimony as having been based on hearsay. (194 Pac. 39.)

Interpretation of Washington Commission Law as It Affects Change of Rate by Utility.—The Supreme Court of the State of Washington has, reversing the court below, found, in North Coast Power Company vs. Public Service Commission, that an electric company which, after the Public Service Commission law went into effect, entered into a contract with a municipality for furnishing energy at a stipulated price may increase its rates without an order of the commission where changed conditions render the contract rate unprofitable, notwithstanding a section of the law declaring that nothing in the act shall prevent any such public utility from continuing to furnish service under contracts in force at the effective date of the act, but that the commission shall have power to direct the termination of such contracts. This limitation, the court holds, applies only to contracts entered into before the act became effective. The Public Service Commission, which had found the new rates fair, was therefore ordered to set aside the order issued by it postponing their enforcement and to enter one dismissing the complaint of the city of Centralia, the municipality concerned. (194 Pac. 587.)

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Extensions of Service as Affected by Rate of Return.—The Public Service Commission of Missouri has refused approval to regulations of the Jefferson City Light, Heat & Power Company requiring persons desiring extension of service to advance the estimated cost of construction, the commission holding that such regulations are not justified where the utility company is receiving a fair return on its property.

Privileges to Directors Are Discriminatory.—Unless they are actively engaged in the operation of the plant the directors of a public utility should receive compensation only in the form of dividends, according to a decision of the Missouri Public Service Commission, and to give them a flat rate for the electricity consumed by them exactly equivalent to a sum allowed them as salary—that is, to supply them with free energy by way of salary—is discriminatory.

Financing Rural Extensions. — In passing upon the proposed rules of the Eastern Wisconsin Electric Company with respect to rural electric extensions, the Wisconsin Railroad Commission authorized the company, as an emergency provision, to require from an applicant for extension of service a deposit equal to the total estimated construction cost of the extension, with a refund to be made of one-half of all the monthly bills paid during a period of four years, any portion of the deposit remaining in the utility's hands at the end of the four-year period to be the property of the public utility.

Present Conditions Call for Circumspection in Granting Rate Increases.—Refusing to grant more than part of an increase in gas rates asked by the Freeport Gas Company, the Public Utilities Commission of Illinois said recently: "It is clear that the inevitable reaction from war prices is already well under way in this country, and the signs of financial depression now so prevalent about us cannot be ignored. While thus far lighting materials have been virtually unaffected by the tendency of lower prices, it must be evident to even casual investigators that industrial depression must effectively operate to reduce the prices of oil, coal and other materials essential to the production of gas, electricity and other utility services. It is now a matter of almost daily testimony before this commission that labor has increased in efficiency within the last few months."

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

Thomas Sproule has recently resigned as assistant engineer of transmission and distribution of the Philadelphia Electric Company to become associated with the Public Service Electric Company of New Jersey as assistant to W. K. Vanderpoel, general superintendent of distribution. Mr. Sproule has been a

THOMAS SPROULE

member of the engineering department of the Philadelphia Electric Company since the organization of that company and has been active not only in its engineering work but in many engineering associations and affiliated societies. He took an active part in the formation of the Philadelphia Electric Section of the National Electric Light Association and was elected its third president. In 1919 Mr. Sproule also served as president of the Pennsylvania Electric Association, having served before and since that time on its important committees. At the time of his resignation he was acting chairman of the technical section of that association. Mr. Sproule is a member of the overhead systems, inductive interference and underground systems committees of the National Electric Light Association and chairman of the safety rules committee. In 1914, while chairman of the overhead systems committee, he was largely responsible for the editing and publishing of the handbook on overhead-line construction, which is a very valuable compilation for distribution engineers. He has also served on many joint committees dealing with wire crossings, joint use of poles, safety code, etc. In addition, Mr. Sproule is a member of the American Institute of Electrical Engineers, the Illuminating Engineering Society, the National Electric Light Association, the American Electric Railway Association and the Engineers' Club of Philadelphia. Mr. Sproule was born in Philadelphia and received his early education there. He entered the electrical industry in 1895 with the Brush Electric Company, which was later merged with the Philadelphia Electric Company.

Arthur Prager, who was elected president of the New Mexico Electrical Association for the year 1921, has been engaged in the public utility business since 1907, having served most of that time with the Federal Light & Traction Company, which owns and operates public utilities in the West and Middle West. Mr. Prager was born in Trinidad, Col., in 1890. He was connected with the Trinidad Electric Transmission, Railway & Gas Company for a number of years and was transferred to the Deming (N. M.) Ice & Electric Company and then to Albuquerque, N. M., as auditor of the company for three years. From this post he was promoted to be assistant treasurer of the Springfield (Mo.) Gas & Electric Company and Springfield Traction Company and served in that capacity for a three-year period. He resigned to enter the United States Army, remaining until the close of the war. After his discharge from the army he was made manager of the Albuquerque (N. M.) Gas & Electric

ARTHUR PRAGER

Company. Mr. Prager has served as an officer of the New Mexico Electrical Association for the past two years and was elected president at the annual convention held in Albuquerque in February.

Benjamin F. Cleaves, chairman of the Maine Public Utilities Commission since its establishment in 1914, has tendered his resignation to take up the management of the Associated Industries of Maine, with headquarters at Augusta. Chairman Cleaves is a native of Waterboro, Me., and was graduated from the Biddeford High School in 1885. He read law in the offices of Hamilton & Haley, was admitted to the bar in 1892, and practiced law at Biddeford thenceforth, ultimately becoming a member of the firm of Cleaves, Waterhouse & Emery. With the establishment of the Maine commission he sought to create an understanding between the utilities, the public and the commission which was peculiarly adapted to the conditions

B. F. CLEAVES

prevalent in Maine and which has borne fruit in a regulation of marked breadth of view, straightforward action and a sane and sympathetic realization of the problems of public utility service and financing. The decisions of the Maine commission under Chairman Cleaves' guidance have been strikingly free from unnecessary complications of legal phraseology and very readable. The board's work has borne witness to a practical appreciation of public utility affairs not always encountered in regulative tribunals of comparatively short experience. The New England Geographic Division of the National Electric Light Association has twice been the beneficiary of Chairman Cleaves' ability to set forth the issues of the day in public relations, and at the Kineo convention last fall he made a strong plea for the extension of publicity work along the line of better educating the public at large in the problems of service, financing and general development confronting the industry, offering his earnest co-operation in this work. Last year he traveled about 25,000 miles in Maine, seeking to bring the interests of the public and the companies into intelligent accord and striving to give the scattered population of the state the benefit of the commission's understanding with minimum formality and expense.

C. W. M'KAY

Charles W. McKay, president and general manager of McKay & Sherman, a recently organized firm of valuation engineers in Chicago, was formerly connected with the engineering firm of McMeen & Miller and was chief appraisal engineer for L. V. Estes, Inc., of Chicago. Upon graduation from Cornell University in 1906 Mr. McKay entered the employ of the New York & New Jersey Telephone Company, serving an apprenticeship in the maintenance department. In 1909 he was promoted to the position of engineer for the North Brooklyn district, and in 1910, when the New York Telephone Company absorbed the Bell companies, serving the New York district, Mr. McKay was assigned to special work inspecting the newly acquired properties. During 1912 he was engineer of the Borough of Queens. From 1912 to 1913 he was associated with Henry Floy in the capacity of assistant engineer on several important appraisal cases. In the summer of 1913 he became engineer to the McCall & Clark Company, efficiency experts of New York City. He resigned this position to become associated with McMeen & Miller in Chicago on problems involving the appraisement of public utility properties. Later he was engaged in valuation work for the Central Union Telephone Company and continued in this capacity until his appointment with the Cooley & Marvin Company. In 1919 he was placed in charge of the appraisal division of L. V. Estes, Inc., of Chicago. Mr. McKay has written numerous articles on appraisal subjects for the technical press and is the author of "Valuing Industrial Properties" and "Telephone Rates and Values." The firm of McKay & Sherman will specialize in problems involving the valuation of electric utility and industrial properties. P. C. Sherman, who holds the position of vice-president, is a well-known industrial engineer, heretofore president of Sherman & Associates, Inc., New York City.

B. H. Gardner, sales manager Connecticut Light & Power Company, Waterbury, Conn., has resigned to become manager of the Lafayette district of the Northern Indiana Gas & Electric Company, Lafayette, Ind. Mr. Gardner was graduated from the electrical and mechanical engineering course at Clemson College, S. C., in 1903. After two and one-half years with the General Electric Company at Schenectady, N. Y., he spent six years with the Dayton (Ohio) Power & Light Company, most of his time being devoted to power engineering work. In early 1912 he was appointed power engineer of the United Electric Light & Water Company, a predecessor of the Connecticut Light & Power Company, and served in this capacity for two years, with headquarters at Waterbury. He was then transferred to Norwalk, Conn., as superintendent of the gas and electric property there and in 1917 was again transferred to New Britain as district superintendent. In the fall of 1919 he was appointed sales manager of the company, with offices at Waterbury.

A. M. Little, who for the past ten years has been president of the Mohawk Electrical Supply Company of Syracuse, N. Y., has recently resigned to take up other work. His future plans have not yet been announced.

E. S. Janison has been appointed acting general sales manager of the Goulds Manufacturing Company, Seneca Falls, N. Y., to succeed W. E. Dickey, who retired on Jan. 1. For the last five years Mr. Janison has been manager of the company's Philadelphia office.

Alfred J. Paine, who became treasurer of the McKenney & Waterbury Company, Inc., Boston, March 1, has been with the McKenney & Waterbury house for seventeen years in capacities ranging from salesman to general manager. He occupied the latter post until the purchase of the concern by himself and M. W. Vye. A native of Malden, Mass., Mr. Paine's entire business career has been spent in the fixture field, first with the house of R. Hollings, Boston, and then with the E. H. Tarbell Company, Boston, before joining the staff of McKenney & Waterbury.

A. J. PAINE

F. C. FOSTER

F. C. Foster, for four years sales manager of the Buckeye Electric Division, National Lamp Works, Cleveland, has just assumed the position of director of sales with the Laundryette Manufacturing Company, Cleveland.

Obituary

Francis Robbins Upton, former associate of Thomas A. Edison and first president of the Edison Pioneers, an organization of men who worked with Mr. Edison in the early days of the inventor's great successes, died on March 10 at his home in Orange, N. J., following a long illness. When Mr. Edison was notified of the death of his former aid he spoke feelingly of their long association. "Mr. Upton was one of my old pioneers," said Mr. Edison. "He was a loyal worker and as a mathematician assisted me in working out the complicated problems as to economy and adaptability of the devices necessary to make a complete system of electric light by incandescence. He was a very fine man. I am sorry to learn he has passed on." Mr. Upton was also associated with Mr. Edison in his ore milling and subsequently was interested in quarries and in selling materials for concrete construction. He was born in Peabody, Mass., July 26, 1852, and educated in Phillips Academy, Andover; Chauncey Hall, Boston; Bowdoin College, Princeton University and Berlin University. His New England progenitors were manufacturers, and he was keenly interested in manufacturing problems, which were part of his work with Edison. Mr. Upton is the last of the "Big Four" who were associated with Mr. Edison in his early activities. The three others were Charles A. Batchelor, the mechanical engineer; John Kreusi, the chief of production, and Edward H. Johnson, the business executor, while Mr. Upton was the physicist and mathematician. Mr. Edison was as comprehensive in selecting his helpers as he has been in every line of work.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Wants of 110,000,000 People Must in Time Be Met

IT IS an old saying that things look blackest just before the dawn. It is not improbable that some such situation now prevails. Outwardly things have looked pretty black for the past three weeks. Inauguration came and went and apparently brought no improvement. Wage cuts have been frequent. Reports on the financial and operating conditions of the railroads played havoc for a while on the stock exchanges. Other poor reports hammered down stock prices. Copper is selling now at its lowest price since 1914, but very little metal is changing hands. The iron and steel business is about at a standstill. On the face of it things look pretty black. Still, there are certain underlying conditions that are quite favorable.

Spring is here and will bring a certain amount of new building. In the metropolitan area of New York this will be stimulated by the city's action in withdrawing new dwelling houses from the tax list for ten years. Moreover, spring brings a certain amount of rehabilitation work from many sources. Besides, there are millions of dollars to be spent this year on municipal improvements. Word comes from the automobile centers of the Middle West this week that business is picking up. This affects a number of lines. Non-employment, while showing an increase in February, bids fair to show a decrease in March. The textile industry, one of the largest employers, is again taking on men. The same is true of a number of other fundamental commodity industries.

Finally, there are the wants of 110,000,000 people to be met. To feed and clothe these people means production and transportation. The public can't continue on a buying strike forever. It may be several months before buying reaches factory capacity, but in the meantime it looks as though a fair business could be expected.

Cross-Arm Prices Are Again Reduced

PRICE decreases on Rainier fir and longleaf-pine crossarms varying from 9 to 15 per cent are announced by representative producers effective March 1. This is the second decrease within a month, the first amounting to 15 per cent and becoming effective on Feb. 1, as stated in the Feb. 5 issue of the ELECTRICAL WORLD. The supply of arms both with jobbers and at distributing yards is reported good, with stock shipments prevailing. Demand remains uneven in different sections of the country and among different producers. On the one hand buying is said to be slow with only a few straggling orders coming in. Some producers, however, state that sales have picked up recently with more inquiries and greater interest being shown in the market by consumers who are looking forward to their spring needs.

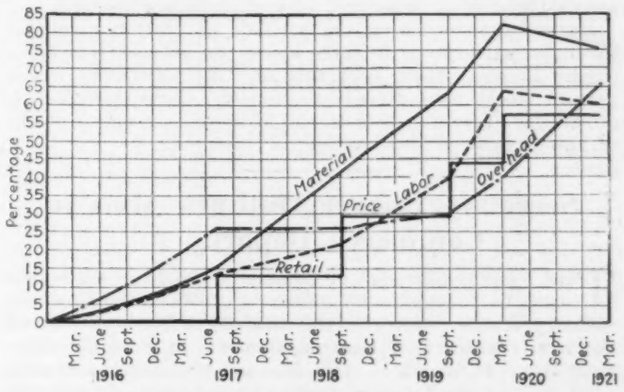
Representative prices now in effect on fir arms per 100 delivered are as follows: Electric light arms, 3¼ in. x 4¼ in. x 3 ft., two pins, less than 1,000 lineal feet, New York $56.99, Chicago $52.57, and 1,000 to 3,000 lineal feet, New York $50.66, Chicago $46.73; 3¼ in. x 4¼ in. x 6 feet, six pins, less than 1,000 lineal feet, New York $113.99, Chicago $105.13, and 1,000 to 3,000 lineal feet, New York $101.33, Chicago $93.45. N. E. L. A. arms, 3½ in. x 4½ in. x 5 ft. 7 in., four pins, less than 1,000 lineal feet lots, in New York cost $128.92, Chicago $118.90, and 1,000 to 3,000 lineal feet, New York $114.59, Chicago $105.69. New England arms, 3¼ in. x 4¼ in. x 5 ft. 6 in., four pins, lots of less than 1,000 lineal feet in New York cost $113.99, Chicago $105.13, and 1,000 to 3,000 lineal feet lots, New York $101.33, Chicago $93.45.

Increases in Vacuum-Cleaner Cost and Prices

IN THE general discussions going on at the present time concerning the possibilities of reductions in prices of various commodities and specialties, and in numerous requests made to manufacturers asking for a guarantee against price declines, F. J. Gottron, general manager of the P. A. Geier Company, Cleveland, Ohio, has gathered some data on retail selling price, cost of material, labor and overhead, as applied to one make of vacuum cleaner and set the cost down in curve form for comparative purposes.

Retail prices on July 1, 1917, went from $35 to $40; on Sept. 1, 1918, they went to $45. This was increased on Sept. 1, 1919, to $50 and on March 1, 1920, to $55.

While these increases were being made, it is interesting to note from the other curves, the increase in materials on March 1, 1920, above the 1916 level was approximately 84


Percentage
Material
Price
Labor
Overhead
Retail
Mar. June Sept. Dec. Mar. June Sept. Dec. Mar. June Sept. Dec. Mar. June Sept. Dec. Mar. June Sept. Dec. Mar.
1916 1917 1918 1919 1920 1921

COSTS AND PRICES IN LAST FOUR YEARS

per cent, the increase in labor about 63 per cent and the increase in overhead about 40 per cent.

Since March, 1920, there has been a slight decline in the cost of materials and a very slight reduction in the cost of labor, but reference to the overhead-cost curve will show that it has gone up very abruptly and has now reached the unprecedented height of 65 per cent above normal. This rapid increase in overhead is due, of course, to the drop in the volume of business and the resultant high cost per unit of advertising, selling and general overhead expense.

Fiber Conduit Stocks in Good Volume at Mills

UNLIKE usual buying conditions in the fiber-conduit field at this time of year, the present market is quite dull. Manufacturers at the same time have built up large stocks of this material to handle business which is expected to come in later in the spring and summer with request for quick delivery. No difficulty can be experienced now in shipping common sizes from stock. To continue this condition the mills as a whole are working virtually full time. To be sure, orders have been taken for good amounts

for spring delivery, and the early break up of winter is providing an added incentive to purchase at this time. Many power stations have plans ready for heavy extensions, but these are being held in abeyance till a later time. Certain parts of the Southwest, West and Central States have been in the market already, with some amounts coming from the East. Still, as a whole, business is dull, but with the general trend of municipalities to place their lines underground the future stands out very brightly.

In line with prices of other commodities, at least one mill has reduced its price in an amount ranging from 15 to 18 per cent. Up to date no other instances of a price drop have been found.

Balancing of Stocks Important Factor in Jobbing

THE function of a jobber as a carrier of stocks was well discussed in the open meeting this past Tuesday of the Atlantic Division, Electrical Supply Jobbers' Association, held in New York. W. I. Bickford, in speaking on the "Necessity for maintaining stocks for service under all conditions," said that although a year ago a jobber was more or less justified in being without stocks, at this time there was no excuse whatever. Manufacturers can make immediate shipments on virtually any kind of jobber material, and it is a shortsighted policy for any jobber to let his stocks run out on any item.

A balanced stock is the essential thing to work for, and because some items may be excessive is no reason for a jobber permitting other items to run low. One of the prime functions of a jobber is to provide stocks to meet prevailing demands, and no matter how bad business conditions are a lack of stock certainly can not be said to meet even the little demand which is existent. The good will of the customer is an important adjunct to future business.

During the discussion the attitude of certain manufacturers in attempting to force stocks on jobbers was criticised. It was shown that this was the case even where present stocks were already too heavy. Some manufacturers held the threat of withdrawal of their lines unless stocks of new lines were also laid in.

Secretary Hoover Outlines Aims in Commerce Department

THAT the Department of Commerce should in the widest sense be a department of service to the commerce and industry of the country is the attitude of Herbert Hoover, the new Secretary of that department, in a public statement made on March 11. He does not consider it a department for the regulation of trade and industry. In order to do service to the greatest advantage he wishes to establish a wider and better organized co-operation with the trade and commercial associations, and will in a short time present some plans to this end. He desires to see efforts to push this country's foreign commerce more closely related to its industries.

"In the long run," says Secretary Hoover, "we may as well realize that we must face a lower standard of living in Europe for many years ahead. The production cost of her people will in consequence be lower than even before the war. If we meet this competition and still maintain our high standards of living we shall have to work harder, we shall have to eliminate waste, we shall need still further to improve our processes, our labor relationship and business methods.

"There are some of these directions—possible improvements and elimination of our great waste in labor, in material, in power and a host of other directions—in which I believe this department can secure some results by co-operation with the different trades and industries.

It is generally known that the Secretary is a firm believer in standardization of products, materials, methods, etc., as an economic necessity. In discussing foreign trade Secretary Hoover outlined the tendency in European nations to mobilize definitely the export and in some cases the import trade for militant commercial invasion. In some instances this is being done under government direction and organization and often even with government finance; in others it is being carried out by government leadership and suggestion. These are some of the conditions which American manufacturers must meet.

Pole-Line Hardware Consumers Not Covering Spring Needs

A SURVEY of the pole-line hardware market reveals the fact that utilities are not anticipating their spring needs. Some business has been placed, but the market on the whole is quiet. Restricted buying power with both power companies and electric railways is largely blamed by manufacturers for the light demand. It is expected, however, that by the end of next month sales should have picked up considerably.

Producers are continuing production of hardware, though in some cases reserve supplies are not large. One company, in fact, reports being still as long as three to four weeks behind in its line hardware department. In general, however, stocks are more than ample for present needs, and on reasonable size orders consumers may count on stock to one-week shipments.

Prices have not changed since general reductions of from 5 to 7½ per cent were put into effect by leading manufacturers about the middle of February. This is the second general cut that has occurred, as decreases of from 5 to 15 per cent were made during December and early January. In some quarters the view is heard that present quotations have about reached bottom. Prices quoted by a representative producer f.o.b. Chicago are as follows: Carriage bolts, ⅜ in. x 4½ in., $2.31 per 100; crossarm braces, 1¼ in. x ¼ in. x 28 in., $14.42 per 100; lag screws, ½ in. x 4 in., $4.02 per 100; machine bolts, ⅝ in. x 12 in., $10.65 per 100. New York prices are about 20 per cent higher than the above to allow for freight and warehouse charges.

The Metal Market Situation

CONDITIONS in the copper market remain unchanged. It is strictly a buyers' market with no improvement in demand. Producers of finished brass and bronze goods have again cut prices, but there is not enough demand for those products to warrant much buying of copper. Foreign orders are slight too, and though production is being curtailed in an effort to prevent stocks of copper piling up, output is still greater than consumption, it seems.

Large producers hold aloof with nominal quotations of 12.75 to 13 cents for March delivery, but small interests are actively competing for business at prices of 12 to 12.25 cents for prompt shipment. Only small quantities are obtainable at these prices, however. Small lots can also be obtained at 12.25 cents delivered for April shipments and 12.50 cents for June. The outside market is inactive, with prices fractionally higher than the above.

The market for lead is quiet but steady. There is very little movement of zinc, the price of spot having receded in consumer demand.

NEW YORK METAL MARKET PRICE

	March 9, 1921	March 15, 1921
Copper	£ s d	£ s d
London, standard spot	65 10 0	67 0 0
	Cents per Pound	Cents per Pound
Prime Lake	12.50	12.25—12.50
Electrolytic	12.25	12.00—12.25
Casting	12.00	11.75
Wire base	15.00	15.00
Lead, trust price	4.00	4.00
Antimony	5.20	5.50
Nickel, ingot	41.00	41.00
Sheet zinc, f.o.b. smelter	11.00	11.00
Zinc, spot	5.30	5.27½
Tin	27.50	28.50
Aluminum, 98 to 99 per cent	28.00	28.00

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	10.25-10.50	10.00-10.25
Brass, heavy	6.00- 6.50	5.75- 6.00
Brass, light	4.00- 4.25	4.00- 4.25
Lead, heavy	3.25- 3.50	3.25- 3.50
Zinc, old scrap	2.87- 3.00	2.87½ 3.00

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

THE electrical industry is marking time and nothing more. In virtually every section of the country trade continues on the same fairly quiet level as heretofore. Until a return of general business, and more especially until improvement in the volume of building work is noted, this condition bids fair to continue. The electrical industry cannot lead the way; it must follow prosperity in other lines of business. Just now it is suffering from a wave of cautious retrenchment, of "holding back for the other fellow."

This is seen all the way up the line as not only the ultimate consumer and the retailer are buying cautiously but also jobbers as a rule are ordering only for current needs, and this phase is in turn passed on to the manufacturer. Stocks are being held low, but are more than ample for current needs in nearly every line.

NEW YORK

The trade as a whole is further postponing the date by which a return of good business is expected. During the early winter the President's inauguration was quite generally looked forward to as the turning point, but as yet there is little or no change in week-to-week conditions. Several jobbers now state that they do not look for a return of normal business before midsummer, but it appears that one man's guess is as good as another's.

The present market for electrical material is quiet on the whole. The one thing apparently needed above all others to act as a stimulus to buying is lacking as yet, and that is a large volume of building construction. Until normal construction work is again resumed demand for staple supply items will probably remain light as at present. Retailers are very cautious in their buying, partly because of money tightness and poor demand and in some instances because of expectations of somewhat lower prices in certain lines. Jobbers in turn are ordering very conservatively, not more than for current needs. Fan buying of jobbers from this section, it appears, will be light this season. Porcelain prices were revised by manufacturers the first week in March, the reduction on knobs, tubes and cleats amounting to about 17 per cent.

Fans.—Since price reductions of about 10 per cent were announced by manufacturers the latter part of February many jobbers have placed orders, but the buying in nearly all cases is on a very conservative basis. Stocks held over are large.

Sockets.—With pulls listing at 60 cents, keys 33 cents and keyless 30 cents, jobbers are giving a discount of from 15 to 18 per cent in standard-package quantities. Demand is slow.

Conduit.—Prices cover a wide range and buyers generally resort to shopping. On 2,500 ft. of ½-in. black as low as $67.50, with intermediate prices up to slightly over $79, was quoted this week, and for the same size in galvanized the price ranged from $72.60 to $84.50. The lower level seems more nearly representative of the market, however. Demand is slight and stocks fair.

Outlet Boxes.—In quantities of 100 the current discount quoted by jobbers holds about 29 to 30 per cent on black boxes and 21 to 25 per cent on galvanized. Stocks are more than ample for the light demand.

Flexible Armored Conductor.—No. 14, two-wire, double-strip, in 1,000-ft. lots, is worth from $63 to $65. Stocks are fairly low and demand small.

Non-Metallic Flexible Conduit.—Demand is light and stocks vary but are more than adequate. In quantities of 1,000 ft. the average discount quoted by jobbers on ⅜-in. and ½-in. sizes ranges around 47 to 50 per cent, though 40 per cent is quoted by one representative house.

Flush Switches.—The call for this line is very light, and consequently jobbers are not carrying many in stock.

Rubber-Covered Wire.—Demand continues poor, but most jobbers have reduced stocks to fairly average levels. In 10,000-ft. lots No. 14 is quoted at from $7.50 to $8.50 per 1,000 ft. Prices are more or less readily shaded and buyers shop around a good deal.

Porcelain.—A revision of prices is announced by several manufacturers, effective in some cases March 3 and in others March 5. The reduction on knobs, tubes and cleats in a representative instance amounts to 16⅔ per cent. "Nail-it" knobs list for $70 per 1,000, 3-in. x ⅝-in. tubes at $23 per 1,000, and two-wire unglazed cleats $52 per 1,000.

CHICAGO

Locally the retail trade reflects a feeling of gloom owing to the difficulty with which stocks are moved. Investigation in a score of stores fails to bear out the statement that the retailers are refusing to bear their portion of the burden of stock carrying, leaving it all to the jobber and manufacturer. All sorts of stock conditions are found. The great majority of dealers, however, are found to have adequate stocks and to be reordering as heavily as prudence will permit.

General business conditions are improving, very slowly but steadily. Every day sees the inception of a number of apartment or residence projects, and more actual construction of this sort is under way now than there has been for five years. Contractors have notified the Building Trades Council that at the expiration of existing agreements on May 1 there will be a reduction in skilled labor from $1.25 to $1 per hour or no agreement will be signed, which means open shop.

Bare Copper Wire.—Sales, lively on low prices a short time ago, are now quieter owing to uncertainty of the price future. Quotations are unsatisfactory but quantity transactions at around 15 cents are admitted as possible. It is probable that 15¾ cents and 16¼ cents is a proper reflection of the present market on No. 8 in 1,000-lb. lots.

Insulated Wire.—Base on triple-braid weatherproof has been reduced to 18 cents, which makes the quotation on No. 6 triple-braid 19 cents per pound in 1,000-lb. lots. This price is subject to variation, depending on the needs of buyer and seller. Owing to the apparent possibility of even lower prices, buying has fallen off in the last week. No. 14 rubber-covered is quoted at $7.75 and $7.85 per 1,000 ft.

Poles.—Business is seasonably quiet, and it is a question as to whether it is going to improve very much with the advent of the construction season. Buyers believe that lowered labor cost should bring lower prices, while all producing interests maintain that they are as low as they are going to be.

Heating Appliances.—Great quiet is reported by dealers, jobbers and makers. No recent price changes are noted. A small amount of routine buying is being done by the public, but not enough to cause any strength in the trade.

Hollow Ware.—The buying public is freely expressing its opinion that prices are too high and sales by retailers are at a minimum. The employment situation, which is acute, undoubtedly is curtailing business in this class of material.

Washing Machines.—A canvass of the retail situation develops the fact that more washing machines are being sold than all other varieties of appliances put together. Installment payments are a great factor in this. Less price cutting is reported, and almost no complaint is made by the public in regard to price.

BOSTON

Increased activity in electrical supplies for automobiles and easier prices on porcelain products, weatherproof and bare copper wire and rigid conduit were features of the Boston market at the beginning of this week. Inquiries show a healthier tone as regards motors, and efforts to start building construction held up by strikes marked the week just closed. The indications are that conditions will improve considerably in the building trade through at least partial resumption of work upon the employers' terms in the near future. Jobbers' stocks are not being increased much and are equal to most demands. Collections are poor. Except in insulators deliveries appear to be thoroughly satisfactory. In industrial circles the weeding out of inefficient employees continues to liquidate the labor situation.

Wire.—Rubber-covered wire holds firm around $8 per 1,000 ft. in 5,000-ft. lots, weatherproof base is off to 17 cents, and bare base has slumped to 16 cents, with good stocks and light demand.

Rigid Conduit.—Boston jobbers are quoting pipe in all sizes, black and galvanized, on a two-column price classification. On 5,000-lb. lots and less the former 5,000-lb. rate applies, and above 5,000 lb. the old carload rate is quoted. This results in reductions estimated between 10 and 20 per cent and is expected to stimulate some business.

Motors.—Inquiries are increasing somewhat, and a revival of proposition work is yielding encouragement to a rather drab market. Competition is very keen for business, and large stocks are in hand. Prices are steady, considering the pressure upon agencies for more stocks.

Non-Metallic Flexible Conduit.—In 5,000-ft. lots the $\frac{1}{2}$-in. size is selling at $22 per 1,000 ft. and the $\frac{3}{4}$-in. size at $24. A dull market is evident, with heavy stocks.

Ranges.—Manufacturing for factory stock continues in anticipation of active spring business. Prices are steady.

Radiators.—Sales are moderate with excellent factory deliveries and good prospects for active demand with the closing of the furnace-heating season. Steady prices prevail.

Starting and Lighting Sets.—Trade is brisk, with good stocks and firm prices. Many cars are being put into service on account of the mild weather and unusually good road conditions prevailing.

Porcelain Insulating Material.—Readjusted price schedules yielding reductions of about 10 per cent are now in effect. The demand is light. "Nail-it" knobs are steady at $27 per 1,000 in barrel lots. On Monday 3-in. tubes were selling at $9.50 per 1,000 in barrel lots, with plenty in hand.

Appliances.—Reduced prices on the less modern designs are bearing fruit in sustained buying, notably in flatirons, table lamps and light heating equipment.

Flexible Armored Conductor.—No. 14 double-strip brought $60 in 2,500-lb. lots Monday. Larger quantities showed some weakness in prices.

ATLANTA

The strike of employees of the Atlanta, Birmingham & Atlantic Railway has prevented either freight or passenger trains from being operated over that road for two weeks. Approximately forty towns in southern Georgia and southern Alabama are thus deprived of all railway communication, with a consequent demoralization of business in that section. Unless train service is resumed very soon heavy losses in the produce and fruit lines will result, it is said, as this road serves one of the largest producing sections in the district.

The voters of Atlanta passed favorably on the issue of $8,850,000 in bonds covering the improvements to waterworks and sewerage system and the construction of schools and a viaduct. This will, of course, serve to sustain local building activities throughout the year, especially as a number of large school buildings are contemplated. Jobbers report that their business is still quiet. Most of the orders received are small in size and are coming from the medium-size contracting firms, while inquiries of industrial plants have fallen off in the past two weeks. Just now municipalities and public utilities are the heavy buyers.

Cross-Arms.—These are moving better than for the last six months, the principal demand being for the standard arm. Stocks are good and shipments satisfactory.

Rigid Conduit.—A price reduction of approximately 5 per cent is to be noted. This line continues to move fairly well; galvanized stocks are reported rather low, but black pipe is on hand in sufficient quantities for all purposes, except in one or two of the more popular sizes.

Safety Switches.—A wider application of the underwriters' ruling is keeping up the demand, and jobbers report sales as very satisfactory. No reductions in price are yet noted, though the trade feels that they are in order. Stocks are in fair condition with shipments three to five weeks.

Insulators.—There is little or no demand for the 2,300-volt porcelain type, but the glass insulators are moving steadily. Stocks of the glass type are in excellent shape, but the porcelain are low. Prices, glass, $9 per 100; porcelain, $20 per 100.

Pole-Line Hardware.—A price reduction of 15 per cent was announced last week, affecting all classes of hardware. As with insulators and cross-arms, there is a heavy demand, particularly for braces and through-bolts. Stocks are reported in fair condition.

Wire.—Little change in price is noted, weatherproof being on a 17-cent base and rubber-covered on a 16-cent base. The former is sluggish, but popular sizes of rubber-covered are in fair demand.

Flexible Armored Conductor.—The heavy price reduction seems to have brought flexible conductor back to an active market, and jobbers report the receipt of good orders. Local stocks are in good condition, and No. 14, two-wire, is offered at $55 per 1,000 ft.

Farm-Lighting Outfits.—Little or no activity is reported in this line, and the trade seems disposed to feel that there will be no movement of note until well toward the end of the summer or early fall. The rural population has no funds at the present time to purchase these plants.

ST. LOUIS

Business conditions not only with the electrical interests but also with industrials generally are making very gradual improvement. Business in this territory has been and is greatly hampered by the marked stagnation in the South, due almost entirely to the inability of the cotton growers to move their product at warrantable prices. The territory comprising states to the east, west and north of St. Louis is developing a healthy tendency toward normal demands. The agriculturists in this territory are able to move their farm products at more favorable prices than those in the South and trade is benefited accordingly. Power sales show a reduction over last year but have been virtually steady for the last few months. Several replacements of large isolated plants are reported.

No price changes worthy of note have occurred in the last week. Stocks generally are normal for the condition of business prevailing. Immediate shipment can be made on almost all items except insulators, for which sixty-day deliveries are still being quoted. Jobbers are becoming gradually more optimistic, but it is the general opinion that there can be no material change for the better in the electrical jobbing line for perhaps six months. Collections are still on a sixty-day basis and are giving no great concern.

No settlement has been reached between the building trades and the contractors on the matter of wage scales, and it is felt that there will be no marked increase in building until wages can be reduced.

Wire.—No. 6 rubber-covered is moving quite slowly because of the lack of industrial activity. The demand for No. 14 shows slight improvement. Prices are unchanged, No. 14 selling at $8.10 per 1,000 ft. in 5,000-ft. lots. Stocks are in excellent condition.

Lamp Cord.—This is one of the few items where it can

be said that normal demand obtains. Stock of jobbers is in good condition, as a rule monthly purchases being made to keep the stocks in line. No. 18 twisted silk sells at $23 to $24 per 1,000 ft. and No. 18 twisted cotton at $15.25.

Conduit.—A fair demand is reported for ½-in. black, but the demand for ¾-in. and larger is quite dull. Prices were reduced recently, ½-in. being quoted from $65 to $70 and the ¾-in., as a rule, from $95 to $98.

Flatirons.—Jobbers' stocks are reported to be about normal, but the stocks of some dealers for a while were heavy. Some price reductions were made by the dealers which to some extent stimulated the demand, until then rather dull.

Fans.—Considerable uncertainty is expressed as to the demand this summer for fans. Good-sized stocks are on hand from last summer, and it seems to be the tendency to await buying until the character of the summer is determined.

Lamps.—A good business in this line for this time of year is being experienced. Stocks are in good shape.

Knobs and Tubes.—The market in these items is competitive owing to heavy stocks in the hands of some jobbers, though other jobbers contend their stocks are in good shape. The demand is generally slow. "Nail-it" knobs are quoted at $23.80 per 1,000, and 3½-in. tubes at $9.20.

SAN FRANCISCO

At no time this year has there been serious delay in shipments of electrical material from the factories to the Coast, although these shipments have decreased in volume because of the completion of many outstanding orders, the decrease of building and the retrenchment policies of customers.

Boxes and Covers.—There has been a slight decrease in the selling prices of boxes and covers to electrical dealers, this decrease figuring about 5 per cent and resulting in standard-package selling at prices of approximately $23.60 per 100 on standard galvanized boxes for rigid conduit and $13.30 per 100 on the most popular covers. Stocks are good, but orders are rather spasmodic.

Motors.—The various Eastern factories have gradually cleaned up their back orders and are making quick deliveries. The sharp change in the character of these deliveries has resulted in several instances in piled-up jobbers' stocks, but in the majority of cases vigilant following has maintained the stocks in a proportionate manner. The volume of business continues very good, for although farmers have had a disappointing return for the last season on their crops, it is highly important for them to continue the future safety of those crops by the installation of efficient irrigation systems. New distributing lines have increased this business in the San Joaquin Valley, but the strike on the lines of the Great Western Power Company has resulted in a curtailment of business, in the Sacramento District especially.

Sewing Machines.—Lately the trend in sales in some sections has been toward a console type of machine, supplied complete with stand, at prices ranging from $110 to $150, which is about double the average prices on the portable machines. However, the portable machine is still the big seller. Sewing-machine motors have sharply dropped from $22.50 list to $18.50 list. This change was rather unexpected, and it is reported that several jobbers found themselves with rather heavy stocks at the old prices.

SEATTLE—PORTLAND

There seems to be considerable optimism apparent in the Northwest, particularly in the Puget Sound district, but manufacturing, constructional and sales activities up to date do not warrant this feeling. True, the lumber mills and logging camps are reopening slowly, construction work is picking up gradually, especially along residence building lines, and certain lines of electrical material and appliances have started moving, but the combined scale of these activities is light. The employment situation is easing gradually with resumption of lumbering and logging operations and with the call from truck gardens, fruit ranches and wheat farms for labor becoming stronger. Wage cuts are being made over the entire Northwest, particularly in lumbering and logging lines, and further decreases in an effort to reduce manufacturing costs are contemplated. No further reductions in wages of building mechanics and laborers are anticipated.

Manufacturers in the Northwest, particularly in the Portland field, report business continuing quiet. Portland jobbers, as well as those in Seattle, say that business is keeping up in fair shape, although it still consists of short orders for the most part. Quotations on pole-line material continue active and another slight price drop was noted in the past week. There is very little contracting business at present. Dealers in good locations, especially in Portland, are having a fair amount of business, some reporting a slight increase over the past few weeks. There is considerable activity in residence building, and prospects for pole-line construction and erection of large buildings of various kinds have not been so good for years. However, to offset this in Portland the unions have refused to accept the wage reduction proposed by building contractors, and contractors have announced that on the expiration of the present agreement on May 1 they will refuse to continue paying present wage scales.

Knobs, Tubes and Cleats.—Generally speaking, these stocks are in good supply, demand is increasing slightly and replacements are easy to obtain.

Ironing Machines.—Considerable interest has been noted, but prices are hindering a movement of any size. Stocks are ample.

Vacuum Cleaners.—Dealers report increased interest, and the more optimistic are of the opinion that this spring's sales will be comparable with or even better than last year. Uncertainty and lack of employment are holding back sales of these and other domestic appliances.

Hollow Ware.—Both retailers and dealers have large stocks on hand; movement is light.

SALT LAKE CITY—DENVER

The outstanding feature of present conditions in electrical merchandising is the determined effort of jobbers and dealers to revive the old-time demand for their wares. The consuming public continues to sit tight in the hope of lower prices. Only the extremely useful and practical kinds of electrical items seem to tempt investment. With the approach of housecleaning time renewed interest is shown in cleaning devices and the business in vacuum cleaners promises to be very satisfactory. Washer campaigns are also going over with fair success. One energetic dealer has gone the limit of advertising "a washer in your home for 25 cents down."

Non-employment is still a factor to be reckoned with. It reflects itself in a reduced demand for many electrical necessities. Dealers who cater to the laboring class feel the pinch especially. Deliveries have not been better in months. Collections show little change, with possibly a slight tendency toward improvement.

Fans.—Jobbers are laboring diligently with their dealers to get them to stock early, and their efforts are not without results. It is believed, however, that little dealer interest will be shown before May. The consumer demands begin early in June. There is no dearth of stocks.

Lamps.—The active lamp season is somewhat on the wane. Empty sockets are pretty well filled and the lengthening days lessen interest in lighting. Stocks are both varied and plentiful.

Ranges.—The retail price remains at a point that makes buying almost prohibitive. Jobbers and dealers would welcome any change that would stimulate consumer interest. Power companies, however, are looking forward to an active summer and are stocking jobbers accordingly.

Panels and Switchboards.—With the slow resumption of building, orders for jobs are coming in. The trade has been virtually nil during the winter months. All kinds of construction materials are on hand in plentiful amounts.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Engineers Establish Department for Apparatus Repair

George F. Motter's Sons, York, Pa., steam and electrical engineers, has established a department for repairs to electric motors, generators, etc., including rewinding of armatures, rotors, rebuilding commutators, making new coils, etc. The construction department of the company follows industrial-plant wiring exclusively in the installation of power equipment and lamps.

Charles Cory Adds Industrial Equipment Department

Charles Cory & Son, Inc., 183-187 Varick Street, New York City, organized on Feb. 1 an industrial equipment department which will handle all the work of the firm in connection with power plants, mines, hydraulic stations and industrial plants. The Cory corporation, as one of the oldest manufacturers of marine electrical and mechanical signaling and communicating systems, fire-alarm systems and lighting equipment, through the aid of its industrial department intends to provide the same service in the commercial field as it now gives in the marine field. The new department is in the hands of L. E. Oneal.

Watts Company Moves Into Larger Quarters

The Watts Company, Philadelphia, has moved its offices from the Pennsylvania Building to 1723 Ludlow Street, where it has taken the entire building. This change was made necessary owing to the increase in business. The company is sales engineer for the Wilmot Engineering Company, manufacturer of the Keystone rivetless chain and bucket elevators and conveyors; the General Manufacturing & Conveyor Company, St. Louis, manufacturer of portable and belt conveyor, and the Allan Manufacturing & Welding Corporation, Buffalo, manufacturer of polyphase arc welding apparatus.

Contract Form Sought by Purchasing Agents' Association

The National Association of Purchasing Agents, 19 Park Place, New York City, in its efforts to make contracts safe and to find a solution of the cancelation evil, is co-operating with various trade, manufacturing and professional associations in the United States and Canada in an attempt to arrive at a co-operative contract form which it will be possible to standardize, according to Harry Botsford, assistant to the president. It is hoped that such a contract form, when universally accepted and established, will result in a crystallization of business opinion toward livng up to contractual obligations.

The plan is that each of the national commodity committees shall work out a contract form meeting with its specific needs. After these forms have been presented to the particular trade, manufacturing and professional organizations interested for suggestions and revisions, various commodity contracts are to be turned over to the Standardization committee for drawing up a basic standard form of contract which, it is hoped, will meet the need of every industry. In seeking a contract form that will be fair to and satisfy not only the buyer but also the seller the association is asking for wide co-operation.

Manufacturer Accumulates Large Stock of Line Hardware

The American Jobbers' Supply Company, Woolworth Building, New York City, reports that it is carrying one of the largest stocks of pole-line hardware at its Chicago factory in the history of the company. Immediate shipments of standard material are made on orders of any size. The company has accumulated this large surplus supply on the expectation of a good demand developing in the near future, and, in fact, sales in the East have increased to such an extent recently that business in that territory, it is stated, compares favorably with the best previous year. In the West and Middle West, however, demand is reported to be small. Central stations are said to account for the greater part of current buying.

Illumination Exhibits Appeal to Plant Executives

An analysis of the figures on attendance at the industrial lighting exhibit that is being shown throughout the country under the auspices of the Edison Lamp Works of the General Electric Company shows that since about the first of March of the 4,000 persons who were present in the twenty-five cities visited about 75 per cent were executives of industrial plants, including presidents, vice-presidents, secretaries, treasurers, purchasing agents and general superintendents.

Ten per cent were foremen, electricians and superintendents and 10 per cent, exclusive of the executives mentioned, were representatives of civic organizations. The remaining 5 per cent comprised architects, engineers, teachers, students, etc. Of course, contractors, dealers, central station men and jobbers' salesmen were in the number.

The point is that the exhibit apparently is reaching the principle industries in each city and fulfilling the educational plan laid out to stimulate better illumination as a means to fewer accidents, increased production and better quality of workmanship.

Advance Electric Completes Six New Agencies

Arrangements have been completed by the Advance Electric Company, St. Louis, Mo., for direct sales agencies for its motors, generators and motor applications with the Blake Electric Company, 1 Rowe's Wharf, Boston; D. J. Vogt, 10718 Amor Avenue, Cleveland; W. C. Fletcher, 2439 College Avenue, Indianapolis; R. R. Caskey, Conway Building, Chicago; W. P. Johnson, 8 North Sixth Street, Minneapolis, and W. I. Cheyney, 922-924 Sansom Street, Philadelphia. Contracts are also pending for New York, Cincinnati and other points.

The Jobber as a Link in the Distribution Chain

In the booklet "The Distribution of Electrical Supplies," part of the campaign of publicity launched by the Electrical Supply Jobbers' Association, 411 South Clinton Street, Chicago, the principal point which appears to be made is that the supply jobber is an indispensable link in the chain of economical distribution of electrical supplies. It is shown that he is headquarters in the service of supplies and that in good times or bad times he has been a stabilizer for the manufacturer and for the user of electrical equipment. In proportion with the extent of participation in the policy of distributing electrical goods through the electrical supply jobber and buying electrical goods from the electrical supply jobber will the efficiency and economy of distribution and purchase improve.

Amateur Radio Convention Just Closed in New York

Branching out into the field of general publicity, the Second District Amateur Radio Convention-Exhibition was held from March 16 to March 19 at the Pennsylvania Hotel in New York City. Realizing the growing interest in radio telephony as well as in radio telegraphy, the Second District Executive Radio Council has taken this opportunity of bringing the amateur public into the closest touch possible with the new developments in apparatus and in electrical wireless communication.

The amateur class has developed rap-

idly from the boy stage, with a good deal of homemade apparatus, to the business-man stage and a higher class of apparatus. Much of the interest in these directions has been in the satisfaction of a hobby and of a pastime which gave unlimited outlet to scientific investigations and thought. From this the field has broadened so that wireless is being used in increasing degree for market and crop reports, news reports and for transmitting operas, concerts, lectures, sermons, addresses, etc. It is in this way that the public is coming more closely in contact with the wireless field and is eager to keep up with the developments shown at the convention and exhibition.

Liberty Machine Organizes

The Liberty Machine Company, Wauwatosa, Wis., has recently been organized to take over the electrical fixture fittings business of the Liberty Foundry of Wauwatosa, owned by William J. Grede. The new company has added to its line of fixture fittings a new porch bracket and contemplates the addition of several other articles in the near future. The Liberty Foundry will continue to manufacture light gray-iron castings, specializing on work for the electrical trade.

Cabell & Irby Change from Retail to Wholesale

The Cabell-Irby Company, Jackson, Miss., recently organized with a capital stock of $100,000, will conduct a wholesale business in electrical supplies in Mississippi and the northern part of Louisiana. Stuart C. Irby and T. B. Cabell, the promoters of this enterprise, conducted a retail and construction business for nearly two years under the name Stuart C. Irby & Company. Mr. Cabell is president, Mr. Irby vice-president and R. O. Jones, Jr., secretary and treasurer.

Screw Thread Commission Makes Progress Report

A progress report of the National Screw Thread Commission has been summarized by H. W. Bearce, chairman. The commission, which was appointed in accordance with the act approved July 18, 1918 (H. R. 10,852), has had the full co-operation of engineering societies, standardization committees, engineers and manufacturers throughout the country, and it has been the desire of the committee to embody in its progress report the best of present-day American screw-thread practice.

As an outline of the work accomplished, fundamental definitions of screw-thread elements, etc., have been agreed upon; a standard form of thread has been adopted, the so-called U. S. or Sellers form; an adequate system of screw threads, consisting of a coarse-thread series and a fine-thread series has been adopted; four kinds of fit have been established, loose, medium, close and wrench fits, and an adequate system of gaging for inspecting has been worked out in detail. In addition, careful consideration was given to the question of tolerances.

The Bureau of Standards and also the superintendent of documents, Government Printing Office, receive applications for this progress report, now ready for distribution.

Florida Court Upholds Legality of Credit Association

An announcement from the National Electrical Credit Association reports a deliverance of the Supreme Court of Florida on the legality of a merchants' mutual credit protective association service. On the basis that the matter of extending credit is a large part of modern business, the decision reasons that merchants have a right to organize for their own protection and agree to report to each other the name of a person to whom credit has been extended and who has failed to pay his account and to agree that they will not extend credit.

The court cited from a decision rendered in the West a clause to the effect that "It is lawful and not libelous for one party to the agreement to report to the others the names of such of his customers as have become delinquent."

The Standard Electric Stove Company, Toledo, Ohio, has made Leon E. Moon, Inc., 1133 Broadway, New York City, its sales representative in New York, effective the latter part of February.

The Hopewell Insulation & Manufacturing Company, Hopewell, Va., announces that it is now represented in Chicago by the Midstates Engineering Company, Westminster Building, which company takes in the district of Ohio, Indiana, Illinois, Michigan, Missouri and Wisconsin.

The Under-Feed Stoker Company of America, Book Building, Detroit, has placed its Western selling agency with the Merkle Machinery Company, of Kansas City. This selling agency has branches in Omaha, Neb., and Tulsa, Okla., selling, designing and installing machinery for power and pumping plants. The Salt Lake City agency has been placed with N. L. Alison, 616 Newhouse Building. The company also will be represented in the Southern territory through Smith & Whitney, Southwestern Life Building, Dallas, Tex.

The Western Agencies Company, 285 Minna Street, San Francisco, has been appointed Pacific representative for the Bleadon-Dun Company, manufacturer in Chicago of electro-medical apparatus. This company's apparatus will be carried in stock at the Los Angeles, San Francisco and Seattle offices of the Western Agencies Company, which will sell to jobbers and assist both wholesalers and retailers in disposing of their stocks.

The North Coast Electric Company and the Northwest Utilitor Company, wholesale dealers in electrical machinery and supplies, are to house their Spokane branches in remodeled quarters at W. 330-36 Sprague Avenue. Main offices of the company are in Seattle. The Spokane branch will maintain a stock of more than $50,000 worth of machinery. Albert Reeves will be the Spokane manager of the North Coast Electric Company.

The Steelduct Company, manufacturer of rigid conduit, Youngstown, Ohio, has appointed two new sales agents. The Wood & Lane Company, St. Louis, will cover the states of Missouri, Kansas, Arkansas, Oklahoma and Tennessee, while the McNair Electric Sales Company, Detroit, will cover Michigan.

The Independent Pneumatic Tool Company, 600 West Jackson Boulevard, Chicago, announces the removal of its Pittsburgh office from 1208 Farmers' Bank Building to 718 Bessemer Building, Sixth Street and Duquesne Way.

The American Atmos Corporation, Pittsburgh, manufacturer of the Atmos and Dreager oxygen resuscitation and breathing apparatus, announces the appointment of George Oliver Smith as vice-president and chief engineer.

The Play-O-Lite Company, formerly of Buffalo, has moved to Worcester, Mass., and will establish a plant in the near future at 215 Front Street to manufacture electric lamps. The company has incorporated under the laws of Massachusetts with a capital stock of $15,000. Allen Frazer, sales manager of the Wickwire-Spencer Steel Corporation, is president.

The Dudley Electric & Machine Company, East Fayette Street, Uniontown, Pa., lost a portion of its plant by fire on Feb. 22. The damage is estimated at $50,000.

The Keystone Hair Insulator Company, 1243 Spring Garden Avenue, Pittsburgh, manufacturer of electrical equipment, is reported to be receiving bids for the erection of a three-story building, 70 ft. x 100 ft., in the vicinity of its present plant.

The Eureka Sales Company, Indianapolis, Ind., dealer in electrical labor-saving devices, etc., has moved into its new three-story and basement building at 34 South Meriden Street. The company will consolidate its wholesale and retail departments with its warehouse.

The Sterling Storage Battery Company, Schenectady, N. Y., has filed notice of reorganization with an active capital of $55,000 and $50,000 in preferred stock. The company manufactures electrical equipment.

The Pruitt-Deming Manufacturing Company, Edinburgh, Ind., recently organized, has completed plans to establish a new plant for the manufacture of storage-battery equipment.

The General Electric Company, Schenectady, N. Y., has completed plans for the construction of its proposed new plant at New Albany, Ind., for the manufacture of electric lamps, to cost about $1,000,000. It will be operated in the name of the National Lamps Works division of the company and will give employment to about 600 operatives.

Foreign Trade Notes

PROPOSED HYDRO-ELECTRIC DEVELOPMENTS IN NETHERLANDS EAST INDIES.—There are indications, according to the London *Engineer*, that great changes will be made in the methods of supplying electricity for light and power in the Netherlands East Indies. Investigations are now under way to determine the possibility of utilizing the water power of the various rivers with a view to equipping for electrical operation the railway systems which are in operation as well as those projected. Housing and building schemes in every portion of the large towns and seaports in Java and Sumatra call for large supplies of electrical apparatus of various types.

ELECTRIFICATION OF FINNISH RAILWAYS PROPOSED.—The Director-General of the Finnish Railways, according to *Electrical Industries*, has announced that steps have been taken to equip the Finnish state railways for electrical operation and that plans and estimates for the work will be prepared during the year.

ELECTRICITY FOR WAIROA, NEW ZEALAND.—The ratepayers of the Wairoa electric power district, according to the *New Zealand Gazette*, have approved the proposal of the Wairoa Electric Power Board to borrow the sum of £100,000 for the following purposes: (1) Erecting main electric transmission and feeder lines between Waikaremoana and the borough of Wairoa, including substations and equipments, to cost £35,000; (2) erecting subsidiary transmission lines, feeders and substations from the main transmission line to outlying districts in Wairoa County, £60,000; (3) purchase of electric motors, equipment, etc., £5,000.

MEXICAN ELECTRIC SYSTEM TAKEN OVER BY CANADIAN COMPANY.—A report from Consul Stewart to the Bureau of Foreign and Domestic Commerce states that the Parral Electric & Telephone Company, an American firm, which operated the electric and telephone systems in Parral, Chihuahua, Mexico, has been acquired by the Compañia Agricola y de Fuerza Electrica del Rio Conchos, S. A., a Canadian company. For a number of years the latter company furnished energy to the Parral company, but now it proposes to distribute electricity direct to the consumer. It took over the system on Jan. 1 and will install a practically new system.

ADDITIONAL CAPITAL FOR ELECTRIC COMPANIES IN GERMANY.—Forty-four electric companies in Germany raised 739,000,000 marks in additional capital stock, while eight new companies issued shares amounting to 28,000,000 marks. The German General Electric Company is asking the public for 300,000,000 marks, bringing its capital to 850,000,000 marks, larger than that of any other company. Krupps' 250,000,000 issue was greatly oversubscribed. The total new capital subscribed last year, 8,202,000 marks, compares with total value of all existing shares in 1913 of 15,500,000,000 marks.

ELECTRIC LIGHT AND POWER PLANT IN PARAGUAY.—A bill has been presented to the Paraguayan Congress authorizing the municipality of Encarnacion to call for bids for electric light and power plants.

ELECTRICALLY LIGHTED TRAINS IN SIBERIA.—The Chinese Eastern Railway is planning to run electrically lighted trains between Harbin and Vladivostok. When improvements are completed on this line the service between Harbin and Manchuli will be improved. The belief is expressed that conditions in Siberia are more stabilized and that the resumption of trade relations will come soon.

ELECTRICAL NEEDS IN SPAIN.—According to a publication of the Guaranty Trust Company of New York, Spain is well provided with foreign goods, particularly of American and German origin, and general buying has decreased. Prospects for future sales depend more than ever upon the quality and prices of articles offered. There is a demand, however, for electro-technical goods, motors and turbines.

NEW ELECTRIC PLANT FOR KARACHI, INDIA.—The Karachi Electric Supply Corporation, Ltd., Consul Richardson reports, is to build a new and larger central generating plant, instead of an extension as originally planned. The proposed station will be equipped with steam-driven turbo-alternators of 1,000 kw. each. The company plans to supply electricity throughout the whole municipal area of Karachi and also to any point within a radius of 20 miles from Karachi.

ELECTRICAL INVESTMENTS IN JAPAN IN 1920.—Investment in new companies in Japan during 1920 totaled 130,000,000 yen in electrical enterprises, 59,600,000 yen in manufactories, 27,700,000 yen in railways and electric traction roads, 25,000,000 yen in banks and 5,200,000 yen in mining, according to the Guaranty Trust Company of New York. The value of the yen a year ago was 47.1 cents and par is 49.8 cents; present value, 48.4 cents.

New Apparatus and Publications

LIGHTING GLASSWARE.—The Jefferson Glass Company, Follansbee, W. Va., has issued photograph No. 35, showing approximately 300 pieces of glassware taken from its catalog. Photo No. 36, showing still more, is in process of issuance.

FIXTURE CHAIN.—The National Chain Company, College Point, L. I., has issued a folder on its lighting fixture chains.

LUBRICATION.—"Lubrication of Steam Turbines," Part 1, is the subject of the February issue of *Lubrication*, published by the Texas Company, 17 Battery Place, New York City.

CONSTRUCTION.—"Achievement" is the caption of a folder being distributed by the J. G. White Engineering Corporation, 43 Exchange Place, New York City, giving information on power developments, etc.

PAPER-MILL DRIVE.—A new type of sectionalized motor drive for paper machines has recently been developed by the General Electric Company.

MOTOR CONNECTOR.—The Bryant Electric Company, Bridgeport, Conn., has brought out a midget motor connector for use on motor-driven socket devices.

CONTROL.—The General Electric Company has developed new types of semi-magnetic and full magnetic control for alternating-current elevator motors.

INDUSTRIAL TRUCKS.—The Baker R & L Company, Cleveland, has developed a duplex compensating suspension for its industrial trucks and tractors.

AMMETER.—The Western Electro-Mechanical Company, Oakland, Cal., has put out its Knopp multi-range alternating-current ammeter for capacity up to 200 amp.

SWITCHES.—In bulletin No. 16-22, Harvey Hubbell, Inc., Bridgeport, Conn., describes the line of toggle flush switches equipped with adjustable aligning lugs and plates.

REDUCING WASHER.—The Safety Electric Products Company, Inc., Los Angeles, has a new reducing washer for conduit and box work.

KNOCKOUT SEAL.—A new knockout seal has been developed by the Safety Electric Products Company, Inc., Los Angeles.

LIGHTING FIXTURE PARTS.—The Crescent Brass Products Company, 8410 Lake Avenue, Cleveland, is distributing a catalog covering its lighting fixture parts.

FEED-WATER FILTER.—The Griscom-Russell Company, 90 West Street, New York City, has issued bulletin No. 615, describing the G-R multiscreen filter, a redesign of the Reilly water filter and grease extractor.

INDUCTION MOTORS AND FREQUENCY CHANGERS.—The General Electric Company, Schenectady, N. Y., has issued bulletin No. 41,521A, describing its high-speed motors and frequency changers.

MAGNETIC PULLEYS.—The Dings Magnetic Separator Company, Milwaukee, is distributing a leaflet describing its magnetic pulley for removing iron and steel from coal.

PUMPING EQUIPMENT.—The Goulds Manufacturing Company, Seneca Falls, N. Y., has issued a catalog describing the Goulds "Autowater" system, electrically-driven pumps, etc. The company is also circulating a small booklet giving instructions for the installation, operation and care of Goulds "Hi-Speed" pumps.

WASHING MACHINES.—The White Lily Manufacturing Company, Davenport, Iowa, has issued a catalog describing "The White Line" washing machines.

ELECTRICAL EQUIPMENT FOR BRIDGES.—Bulletin No. 48,034, issued by the General Electric Company, covers its electrical equipment for movable highway and railway bridges.

CONNECTOR PLUG.—The Ideal Electric Manufacturing Company, 42 Walnut Street, Newark, N. J., is distributing a four-page leaflet describing its "Attachall" plug for irons, toasters, stoves, percolators, etc.

INDICATORS AND GAGES.—The Bacharach Industrial Instrument Company, Homewood Station, Pittsburgh, is distributing pamphlet M, covering its engine indicators (Maihak type). Bulletin G describes its "Easy Read" manometers and gages.

PORTABLE INSTRUMENTS.—The Westinghouse Electric and Manufacturing Company is distributing leaflet No. A3501, describing its type PX portable instruments for general testing purposes.

DESIGNS FOR BOILER PLANT.—E. W. Clark & Company Management Corporation, Huntington Bank Building, Columbus, Ohio, is distributing booklet A, showing designs of unit boiler plants.

SAFETY, SANITATION AND WELFARE.—The United States Steel Corporation, Bureau of Safety, Sanitation and Welfare, 71 Broadway, New York City, has issued bulletin No. 8 on this work.

New Companies

THE AGLOW SALES COMPANY, 671 Third Avenue, New York City, has been organized by Harry and Frank Aglow, the founders of the Artfibre Products Company, which later changed its name to the Fibreduro Corporation. Temporary quarters have been established at the above address by the new company, and it will cover the field in fiber compositions, metal lighting fixtures, art and leaded glass and silk shades.

THE PAOLI WATER & LIGHT COMPANY, Paoli, Ind., has been incorporated with a capital stock of $75,000. The directors are Raymond Stout, C. C. Johnson and R. M. Cass.

THE C. D. ELECTRIC COMPANY, Philadelphia, has been incorporated with a capital stock of $5,000 by F. W. Woodcock, C. A. McClure and others.

THE TINKER BROTHERS ELECTRIC COMPANY, Painesville, Ohio, has been incorporated by C. H. and M. L. Tinker and A. J. Few. The company is capitalized at $25,000.

THE ROCKFORD POWER MACHINERY COMPANY, Rockford, Ill., has been incorporated by Ray Brown, Charles B. Joyce and Perry C. Brown, 706 Seventh Street, with a capital stock of $35,000. The company proposes to manufacture electric winding machinery.

THE PROGRESSIVE ELECTRIC & ENGINEERING COMPANY, Cleveland, Ohio, has been incorporated with a capital stock of $100,000 by H. and E. J. Flesher, M. L. Dilley, E. Horvath and H. Bolotin.

THE NOCATEE ICE & POWER COMPANY, Nocatee, Fla., has been incorporated with a capital stock of $5,000 by F. R. McConnell, C. F. Walker and H. T. Davis.

THE WHEATON LIGHT, ICE & COLD STORAGE COMPANY, Wheaton, Mo., has been incorporated with a capital stock of $40,000. W. A. Davidson is interested in the company.

THE CONNELLY SPRINGS LIGHT & POWER COMPANY, Connelly Springs, N. C., has been incorporated with a capital stock of $25,000 by R. R. Ennis, W. J. Davis and A. C. Page.

THE GLOBE CODE-STANDARD ELECTRIC COMPANY, Hamilton, Ont., has been incorporated by George W. Harper, Roy W. Baxter, Frederick J. Christmas and others. The company is capitalized at $40,000 and proposes to manufacture electric switches, etc.

THE INTERCOURSE (PA.) ELECTRIC COMPANY has been incorporated with a capital stock of $65,000 and has acquired the property and holdings of the Intercourse Electric Light, Heat & Power Company, the Paradise Electrical Company, the Salisbury Electrical Company and the East Lampeter Electrical Company. Enos L. Zimmerman is general manager.

THE UNITED ELECTRIC SERVICE COMPANY, Springfield, Mass., has been incorporated by Edward A. Higney, Palmer, Mass.; John G. Waddell and Charles J. Weston, Springfield. The company is capitalized at $100,000 and proposes to manufacture electrical appliances and equipment.

THE ELECTRIC CHEMICAL LABORATORIES, 527 Gaither Building, Baltimore, Md., has been incorporated with a capital stock of $10,000 by William Hardy, Herman M. North and Samuel H. Reed.

THE REFRACTORY PRODUCTS COMPANY, Fredericksburg, Va., has been incorporated with a capital stock of $300,000 to manufacture insulating material. The officers are: W. S. Quigley, president; L. E. Turk, treasurer, both of New York City and T. M. Cavin, secretary.

Record of Electrical Patents

Notes on United States Patents

(Issued Feb. 22, 1921)

1,369,353. METHOD OF MAKING GRID PLATES; Paul B. Rabe, Chicago, Ill. App. filed April 30, 1919. Apertures and paste-receiving devices are formed by a single punching.

1,369,360. METHOD OF WELDING ELECTRICALLY SHEET-ZINC LAP SEAMS; Edmund Schroder, Berlin, Germany. App. filed Jan. 13, 1917. Resistance welding process.

1,369,403. TESTING APPARATUS; Charles S. Demarest and Hugh F. Shoffstall, Brooklyn, N. Y. App. filed March 19, 1919. For telephone, light and power circuits.

1,369,407. RHEOSTAT; Frederick Diehl, Elizabeth, N. J. App. filed Oct. 2, 1917. Variable, wire-wound.

1,369,408. COMMUTATOR AND COMMUTATOR BAR; Frederick Diehl, Elizabeth, N. J. App. filed April 30, 1918. Iron and copper segment.

1,369,457. ELECTRO-IONIC SYSTEM OF CONTROL AND REGULATION; Frederich W. Meyer, Milwaukee, Wis. App. filed March 22, 1919. Effects of cascade arrangement obtained by a single valve.

1,369,475. IMMERSIBLE HEATING UNIT; Louis J. Schneider, Milwaukee, Wis. App. filed May 11, 1920. Circuit automatically completed when device is immersed.

1,369,516. MAGNETIC SEPARATOR; John P. Bethke, Milwaukee, Wis. App. filed Nov. 5, 1917. Magnetic pulley.

1,369,564. FLASHLIGHT; Frank W. Slady, Bridgeport, Conn. App. filed June 11, 1919. Improved switch.

1,369,578. ELECTRIC FURNACE; Max R. Trembour, Troy, N. Y. App. filed Oct. 1, 1919. Conducting hearth.

1,369,589. ELBOW FITTING FOR ELECTRIC INSTALLATIONS; Wheeler H. Vibber, New London, Conn. App. filed Dec. 2, 1919. For pipe conduit.

1,369,594. IGNITION DEVICE FOR INTERNAL-COMBUSTION ENGINES; Robert A. Williams, Llanwnda, near Carnarvon, Wales. App. filed Sept. 9, 1920. No rotating coils.

1,369,601. HIGH-FREQUENCY ALTERNATOR; Ernst F. W. Alexanderson, Schenectady, N. Y. App. filed Nov. 4, 1918. Improved rotor.

1,369,630. SANITARY MOUTHPIECE COVER; Harry V. Dempster, Minneapolis, Minn. App. filed March 15, 1920. For telephone.

1,369,635. ELECTRICAL CONNECTOR; Harry A. Douglas, Bronson, Mich. App. filed Feb. 19, 1919. For connecting incandescent electric lamps.

1,369,644. SAFETY LAMP; Frank T. Forster, Pittsfield, Mass. App. filed June 7, 1917. For use in mines and explosive factories.

1,369,645. FACILE ASSEMBLY FOR LAMP SOCKETS; Edgar H. Freeman, Trenton, N. J. App. filed Oct. 21, 1916.

1,369,680. BANK CONTACT; Frank A. Lundquist, Chicago, Ill. App. filed July 19, 1918. Automatic telephone exchanges.

1,369,702. ELECTRIC HEATING SYSTEM; Jose A. Oca-Balda, New York, N. Y. App. filed April 12, 1920. Radiator.

1,369,714. ELECTRIC FIXATION OF GASES; George T. Southgate, East Orange, N. J. App. filed April 11, 1918. Fixation of atmospheric nitrogen.

1,369,715. TIRE-WRAPPING MACHINE; Claus Spreckles, San Diego, Cal. App. filed Feb. 28, 1918. For wrapping pneumatic tires.

(Issued March 1, 1921)

1,369,765. POLE AND METHOD OF CONSTRUCTING SAME; Robert L. Alexander, West Allis, Wis. App. filed Aug. 28, 1918. For large alternating-current generators.

1,369,781. SIGNALING SYSTEM; Theodore W. Case, Scipio, N. Y. App. filed Feb. 20, 1918. For detecting visible and invisible light rays.

1,369,796. TROLLEY POLE; Charles S. Essex, Pomeroy, Ohio. App. filed May 2, 1917. For train locomotives.

1,369,805. SECRET-COMMUNICATION SYSTEM; Baxter P. Hamilton, Brooklyn, N. Y. App. filed Dec. 27, 1919. For insuring secrecy.

1,369,813. PRIMARY CELL; Park B. Hyde, East Orange, N. J. App. filed March 18, 1919. Caustic alkali as electrolyte.

1,369,863. GOVERNOR; William M. White, Milwaukee, Wis. App. filed Sept. 15, 1917. Speed governor for generators.

1,369,892. LIGHTING APPARATUS; Ellsworth A. Hawthorne, Bridgeport, Conn. App. filed April 6, 1918. Portable dry-battery lamp.

1,369,900. ELECTRIC LIQUID HEATER; Barnett W. Macy, Jacksonville, Fla. App. filed Jan. 5, 1920. Coil heats pipe.

1,369,931. STORAGE BATTERY; Harry McCreary, Youngstown, Ohio. App. filed May 10, 1920. Used in automobiles.

1,369,935. HOT-AIR SYRINGE; Oscar H. Pieper and Alphonse F. Pieper, Rochester, N. Y. App. filed Aug. 13, 1917. Employed by dentists.

1,369,938. VANITY CASE; Bertha M. Schwab, Good Ground, N. Y. App. filed Dec. 6, 1919. Provision for illumination of mirror.

1,369,984. METAL VAPOR RECTIFIER; Bela B. Schafer, Baden, Switzerland. App. filed July 14, 1920. Means for increasing suction.

1,370,004. CIRCUIT-INTERRUPTING SYSTEM; Lewis W. Chubb, Pittsburgh, Pa. App. filed July 28, 1917. For rectifying.

1,370,005. STARTING MECHANISM FOR GAS ENGINES; Frank Conrad, Pittsburgh, Pa. App. filed July 19, 1913.

1,370,011. STORAGE BATTERY; Bruce Ford, Philadelphia, Pa. App. filed Aug. 23, 1919. Plate support.

1,370,012. VENT COVER FOR STORAGE BATTERIES; Bruce Ford, Philadelphia, Pa. App. filed Sept. 18, 1919. Used on submarines.

1,370,013. STORAGE-BATTERY PLATE; Bruce Ford, Philadelphia, Pa. App. filed Jan. 23, 1920. For starting automobile engines.

1,370,014. STORAGE-BATTERY PLATE OR ELECTRODE; Charles D. Galloway, Philadelphia, Pa. App. filed Sept. 4, 1918. Material inclosed in perforated insulating tubes.

1,370,016. ELECTRIC SYSTEM FOR ELECTRIC FURNACES; Henry A. Greaves and Harry Etchells, Sheffield, England. App. filed Sept. 12, 1918. Three-phase conducting hearth.

1,370,018. TROLLEY SHOE; Oliver P. Hipple, Wilkins Township, Allegheny County, Pa. App. filed March 14, 1917. Current-collecting devices.

1,370,019. MOTER-CONTROL SYSTEM; Henry D. James, Edgewood Park, Pa. App. filed Jan. 29, 1917. For starting.

1,370,033. APPROACH FOR TROLLEY FROGS; Frederick H. Miller, Wilkinsburg, Pa. App. filed April 9, 1919. Renewable approach members.

1,370,034. MOTOR-CONTROL SYSTEM; Leonard Miller, Whitefield, England. App. filed May 6, 1919. Automatic contactor type.

1,370,051. STARTING MECHANISM FOR AUTOMOBILES; Otto S. Schairer, Oakmont, Pa. App. filed Aug. 22, 1913. Different relative speeds operating as a motor and as a generator.

1,370,052. DRY CELL; Arlie W. Schorger, Madison, Wis. App. filed Nov. 19, 1918. Elimination of gauze bag.

1,370,054. DRY CELL AND METHOD OF MANUFACTURING THE SAME; Walter Z. Schulte, Madison, Wis. App. filed May 15, 1920. Bag type.

1,370,055. DRY CELL AND METHOD OF MANUFACTURING THE SAME; Walter B. Schulte, Madison, Wis. App. filed May 15, 1920. To eliminate air bubbles.

1,370,056. TWO-SOLUTION METHOD OF PASTING; Walter B. Schulte, Madison, Wis. App. filed June 10, 1920. Dry cells.

1,370,058. SECONDARY-BATTERY PLATE OR ELECTRODE; Edward W. Smith, Philadelphia, Pa. App. filed Sept. 4, 1918. Conducting rods embedded in active material.

1,370,059. CALLING DEVICE; Ernest R. Smith, San Francisco, Cal. App. filed July 30, 1920. For calling guests at a hotel, etc.

1,370,064. STORAGE-BATTERY SEPARATOR; Godfrey Steerup, Chicago, Ill. App. filed June 7, 1919. Method of treating wood.

1,370,077. DISTRIBUTER UNIT FOR IGNITION SYSTEMS; Ralph H. Whisler, Detroit, Mich. App. filed May 31, 1919. High-tension, high-frequency ignition.

1,370,090. METHOD OF AND MEANS FOR MELTING BRASS AND SIMILAR SCRAP; Walter R. Clark, Bridgeport, Conn. App. filed Aug. 2, 1918. Induction furnace.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

BRATTLEBORO, VT.—The F. R. Patch Manufacturing Company plans to build a power plant and a dam, 125 ft. long and 40 ft. high, on East Creek, one mile north of Brattleboro.

ROYALSTON, MASS.—The installation of an electric plant in Royalston is under consideration. The plans include a transmission line estimated at a cost of between $10,000 and $12,000.

HARTFORD, CONN.—The Board of Health and the Board of Charities have had plans prepared for the construction of a power house and laundry on Vine Street to cost about $77,000. K. G. Lincoln is chairman of the joint committee.

Middle Atlantic States

BROOKLYN, N. Y.—The Brooklyn Edison Company, 360 Pearl Street, has had plans prepared for the construction of a two-story substation, 30 ft. x 100 ft., on Sumpter Street near Stone Street, to cost about $60,000. The company also contemplates the construction of a new coal hoisting and handling plant at Sixty-sixth Street to cost about $125,000.

BROOKLYN, N. Y.—Considerable electrical machinery, refrigerating and ice-manufacturing equipment will be installed in the plant to be built on Tilden Avenue by Rubel Brothers, Glenmore Avenue and Junius Street, at a cost of about $500,000.

CADYVILLE, N. Y.—Bids will soon be asked by the International Paper Company, 30 Church Street, New York City, for the construction of a hydro-electric plant on Saranac Road, Cadyville, to cost about $250,000. A. H. White, 30 Church Street, New York City, is architect and engineer.

CORNING, N. Y.—The Corning Glass Works contemplate the construction of a new power plant to cost about $250,000, including equipment. The Dwight P. Robinson Company, 125 East Forty-sixth Street, New York City, is engineer.

MASPETH, N. Y.—The United States Industrial Alcohol Company, 27 William Street New York City, will install considerable electrical machinery in its plant to be built at Grand Avenue and Harrison Street, Maspeth, to cost about $500,000.

NEW YORK, N. Y.—The Sinram Brothers, 910 East Fifth Street, plan to install electrically operated machinery for conveying, hoisting, etc., in the coal pocket to be constructed on waterfront property on the East River near Thirty-seventh Street.

ROCHESTER, N. Y.—Bids, it is reported, are being asked by Sibley, Lindsay & Curr, East Main Street and Clinton Avenue, for the construction of an addition to the power plant used in connection with their department store.

ROSSIE, N. Y.—The Rossie Electric & Manufacturing Corporation has applied to the Public Service Commission for permission to construct new electric light and power plants at Hammond and Rossie, St. Lawrence County.

ST. GEORGE, S. I., N. Y.—The construction of a municipal power station to supply energy for the ferry terminal and shops, the East Shore piers and municipal trolley lines, has been proposed by Commissioner Whalen of the Department of Plants and Structures. The plans would include the construction and equipment of a 9,000-kw. power plant to cost $1,917,900; substation at Stapleton docks, $57,750; transmission lines to Stapleton and Concord, $9,500; transformer and changes at St. George, $3,000; construction and equipment of additional coal bunker, $30,000; etc.

LINCOLN PARK, N. J.—The establishment of a lighting district in Lincoln Park is contemplated. Pequannock Township Board is in charge of the proposed work.

BAKERSTOWN, PA.—Plans have been completed by the Pittsburgh Cut Flower Company, 116 Seventh Avenue, Pittsburgh, for the construction of a power house at its local plant.

BETHLEHEM, PA.—The Bethlehem Hotel Corporation contemplates the installa-

tion of considerable electrical equipment in the proposed ten-story hotel estimated to cost more than $500,000.

GLEN ROCK, PA.—The erection of an addition to the power house of the Enterprise Furniture Company is under consideration.

PHILADELPHIA, PA.—Plans have been completed by the American Ice Company for the construction of an addition to its power house at Walnut Lane and Belfield Street. Improvements to the present structure will also be made.

SCRANTON, PA. — The electric power plant of the Coalbrook colliery of the Hudson Coal Company, north of this city, it is reported, has been damaged by fire, causing a loss of about $30,000.

BALTIMORE, MD. — The Washington, Baltimore & Annapolis Electric Railroad Company, 108 North Liberty Street, has been granted permission by the Public Service Commission to issue $1,400,000 in notes, part of the proceeds to be used for extensions, improvements, operations, etc.

BALTIMORE, MD.—The Western Maryland Dairy, Inc., Linden Avenue and Dolphin Street, will install considerable electrical and mechanical equipment in the proposed milk pasteurizing and distributing plant to be constructed at an estimated cost of $1,000,000. I. D. Baxter is chairman.

RIVERDALE, MD.—The Council has appointed a committee to prepare plans and specifications for a municipal lighting plant and distributing system.

CHARLESTON, W. VA.—The Virginian Power Company contemplates the installation of a fourth electrical unit, consisting of a 25,000-kva. turbo-generator at its Cabin Creek station. The cost is estimated at $1,000,000.

HUNTINGTON, W. VA. — The Parsons Company, 418½ Tenth Street, it is reported, will receive bids in May for the installation of electrical equipment and mining machinery at its properties in the vicinity of Peach Creek. A. F. Parsons is president and manager.

LEWISBURG, W. VA.—The construction of a power plant at the Lewisburg Seminary for Girls is under consideration. Dr. J. I. Anderson is president; S. S. Johnson People's Bank Building, Lynchburg, is architect.

NORFOLK, VA.—The installation of an ornamental lighting system on Main Street is contemplated. The cost is estimated at $12,000.

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing the following: Until March 25, Charleston, Schedule 7687—miscellaneous quantity of switchboard panels; Philadelphia, Pa., Schedule 7694—miscellaneous quantity of electric cable. Until March 29, Puget Sound, Wash., Schedule 7666—miscellaneous quantity of electric wire and cable; Eastern and Western Yards, Schedule 7664—miscellaneous quantity of electric wire and cable. Until April 1, Mare Island, Cal., Schedule 7686—miscellaneous quantity of magnet wire. Until April 8, Mare Island, Cal., Schedule 7676—nine electric motors. Applications for proposal blanks should designate the schedule desired by number.

WASHINGTON, D. C.—Bids will be received at the office of the Chief Signal Officer of the Army, Washington, D. C., until March 25, circular PR 5929-1aCP, for radio receivers and transmitters in lots of 100, 200, 250 and 300. Further information may be obtained on application to above office.

North Central States

BENTON HARBOR, MICH.—A new curb-lighting system in Benton Harbor is under consideration.

DETROIT, MICH.—The Semet-Solvay Company has had plans prepared for the construction of a new power house.

UNION CITY, MICH.—The proposal to issue $80,000 in bonds for the development of a water-power system west of Union City will be submitted to the voters at an early date.

CINCINNATI, OHIO.—The Stellar Refinery Company, Wooster, has plans under way for the construction of an oil refinery, power house and pumping plant near Cincinnati, to cost about $300 000, including equipment. E. M. Quincy is vice-president.

COLUMBIA, KY.—The plant of the Columbia Light Company has been purchased by S. E. Shiveley, J. S. Knifely and others for $22,000. The new owners, it is understood, plan to make improvements and extensions to the plant.

PEORIA, ILL.—The installation of an ornamental street-lighting system throughout the city is under consideration.

JEFFERSON, WIS. — The question of issuing $22,000 in bonds for improvements to the light and water system is under consideration.

WHITEHALL, WIS.—Plans have been prepared for a power house and other improvements for the county asylum to cost about $12,000. P. K. Risberg is county auditor.

DULUTH, MINN.—The Northern States Electric Construction Company contemplates the installation of a light and power system and the erection of transmission lines. For further information address R. H. Hilgedick, 117 East Second Street.

MINNEAPOLIS, MINN.—The Minneapolis General Electric Company, 15 South Fifth Street, plans to install a new 30,000-kw. steam electric generating unit at its Riverside station. The company also contemplates the erection of a 100,000-volt tie line between St. Paul and Minneapolis for increased service.

BARNES CITY, IOWA.—The Williams Electric Company, recently incorporated with a capital of $20,000, plans to furnish electric light and power service in the city. Fred Williams is president.

BOONE, IOWA.—The Iowa Railway & Light Company contemplates improvements to its local properties during the year to cost about $64,030. F. W. Linsbaugh is manager.

WATER INTAKES AT HELL GATE STATION

Seawall and circulating water intakes for 280,000-kw. Hell Gate station of The United Electric Light & Power Company now being constructed in New York City. The station was designed by Thomas E. Murray, Inc., and will cost approximately $25,000,000.

FULTON, MO.—The construction of a power house at the State Hospital is contemplated. M. O. Biggs is superintendent.

WHEATON, MO.—The Wheaton Light Ice & Cold Storage Company, recently organized, has plans under way for the construction of an electric power plant to cost about $50,000. H. C Hindman is manager.

NOONAN, N. D.—Plans are under consideration to erect an electric power plant at the mines near here to supply electricity in Noonan, Crosby and Ambrose.

CANASTOTA, S. D.—At an election to be held soon the proposal to issue bonds to establish an electric light plant will be submitted to the voters.

FAIRBURY, NEB.—New equipment including a 550-kw. generator and Corliss engine, is being installed at the municipal electric plant. The erection of a 23-mile transmission line to connect at several small towns is also planned.

JUNCTION CITY, KAN. — The United Light & Power Company, Abilene, has completed plans for the extension of its lines into the oil district and the towns of Florence and Peabody.

TOPEKA, KAN.—The State Senate has passed a bill providing for an appropriation of $50,000 for the construction of a new power house at Western University in Quindare.

Southern States

BLACK CREEK, N. C.—A proposal to issue $10,000 in bonds for the installation of an electric light system will be submitted to the voters. W. T. Privett is town clerk.

ELM CITY, N. C.—Arrangements are being made for an issue of electric light bonds to the amount of $25,000. C. Winstead is town clerk.

NEWBERRY, S. C.—Bids, it is reported, will soon be asked for extension to the electric light system and other municipal improvements. Sanders & Sweeny, Anderson, are engineers.

NOCATEE, FLA.—The Nocatee Ice & Power Company, recently organized, contemplates the operation of a local light and power system. F. R. McConnell is interested in the company.

OCALA, FLA.—The Ocklawaha Reclamation Farms have applied to the Federal Power Commission for permission to develop power for public utility purposes at the government lock and dam in the Ocklawaha River, Marion County.

SOUTH JACKSONVILLE, FLA. — The City Council has approved an issue of $190,000 in bonds, part of which will be used for extensions to the electric light and power system.

CLEARWATER, ALA.—The installation of an electric lighting plant in Clearwater is contemplated.

WINONA, MISS. — Arrangements have been made by city officials for an issue of $60,000 in bonds for the purchase of the plant of the Winona Light, Ice, Water & Sewage Company. The plant will be known as the Winona Public Utility Plant and will be entirely remodeled. Lighting and water service will be extended to cover the whole town. John T. Sharp, Jr., Canton, is manager and H. E. Johnson is local superintendent.

COTTER, ARK.—The Dixie Power Company, 1100 Title Guaranty Building, St. Louis, Mo., has been granted permission by the Federal Power Commission to construct a hydro-electric plant and a high-head dam on the White River. The plans include the development of 100,000 primary horsepower for distribution in Arkansas, Missouri and Oklahoma. W. V. Powell is president; Col. H. A. Allen, 23 Metropolitan Block, Chicago, Ill., is consulting engineer.

ALEXANDRIA, LA. — The Louisiana Gas Distributing Corporation, recently organized with a capital of $10,000,000, it is reported, plans to investigate the possibility of distributing electric power and natural gas in Louisiana. William Polk and others are directors of the company.

FREDERICKSBURG, TEX.—The electric light and power plant of Ernest Wilke & Company, it is reported, has been damaged by fire causing a loss of about $35,000. The plant, it is understood, will be rebuilt.

Pacific and Mountain States

KELSO, WASH.—The Long-Bell Lumber Company plans to build an electrically operated lumber mill.

SPOKANE, WASH.—The Amalgamated Gold Mines Company, Blewett, plans to build a hydro-electric plant to cost about $50,000. C. R. Hesseltine is president

LOS ANGELES, CAL. — The Federal Power Commission has approved the application of the Southern California Edison Company for a 200,000-hp. hydro-electric development of the San Joaquin River. This is part of the $100,000,000 project contemplated by the company.

WESTWOOD, CAL.—The Mount Shasta Power Corporation, a subsidiary of the Pacific Gas & Electric Company of San Francisco, plans to build two power houses on the Rising River and Hat Creek watersheds for the Red River Lumber Company. Application is now before the State Railroad Commission for approval of the construction of the power plant and the leasing of certain lands needed by the Mount Shasta Power Corporation in its hydro-electric program on the Pit River.

OGDEN, UTAH—At an election to be held March 26 the proposal to issue $2,025,000 in bonds for an electric lighting system will be submitted to the voters.

Miscellaneous

FORD ISLAND, H. T.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 11, specification 4401, for electric supply and distribution system at Ford Island.